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JOURNAL OF
Agriculture
NOVEMBER 1947



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Hon. E. L. Cullen,

Minister of Agriculture.

This month's cover



No other single influence has had such a marked effect on New Zealand farming as the introduction of the refrigerated transport of primary produce, an aspect of which, the loading of telescoped mutton carcasses in the refrigerated hold of a modern ship, is painted for this month's cover from a photograph by National Publicity Studios, Miramar. After the sailing ship Dunedin landed the first experimental frozen cargo of mutton and butter in England in 1882 tremendous possibilities were opened up for the profitable disposal of the immense quantities of perishable foodstuffs for the production of which New Zealand was eminently suited. The combined value of meat and dairy produce dependent on refrigerated vessels for transport to overseas markets was over £NZ50,000,000 in 1944-45.

New Zealand Department of Agriculture.

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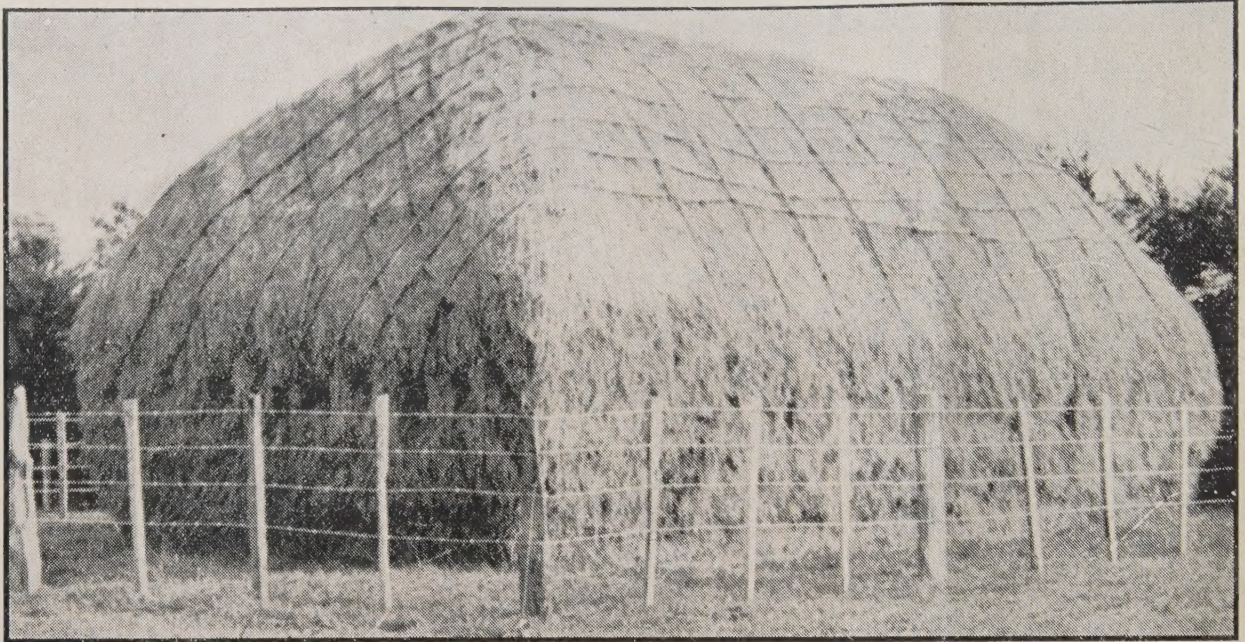
Editor: R. E. Owen

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REGISTERED AT THE G.P.O., WELLINGTON, AS A MAGAZINE.

SAVE MORE HAY



Save as much hay as possible in the summer of 1947-48: greater hay production means better winter feeding and increased dairy production in the 1948-49 season.

- ★ Cut only as much hay at a time as can be properly handled during the curing stage by the machinery and labour available.
- ★ Cut at flowering stage when the greatest weight of nutritious material will be obtained.
- ★ Provide adequate protection of the hay in stack or bales from the weather.

MORE HAY MEANS MORE MILK AND MORE OF THE BUTTER BRITAIN NEEDS

DOMINION HORTICULTURAL STATION TO BE INAUGURATED AT LEVIN



IN the past New Zealand has had few facilities for research work on purely horticultural problems, with the result that methods have often had to be based on overseas recommendations which do not necessarily apply exactly to local conditions. The lack of facilities for research work on purely cultural problems has been felt especially in the market gardening, small fruit, and bulb-growing industries, which now have a number of problems which need looking into at once. The first steps toward remedying that deficiency have now been taken.

Late in 1945 the Government decided to seek a site where a horticultural station could be established, and it was decided that the station should, if possible, be in the Manawatu, bearing in mind the wide range of crops which would have to be grown and the need for the station to be as accessible as possible to growers from all parts of the Dominion. After much search a section which seemed to be suitable was found near Levin, and this area of about 33 acres was finally acquired for a Dominion Horticultural Station in January of this year.

During the earlier years of settlement New Zealand was noted for the ease with which a great variety of fruits and vegetables could be grown in widely-different districts. It was the constant wonder of gardeners that so many of these crops grew and yielded abundantly with little attention to manuring and none at all to the control of diseases and pests, which seem to have been quite unimportant.

Early Advantages Gradually Lost

No doubt this fine healthy condition was the result of growing plants in highly-fertile, newly-broken soils, where no such crops had been grown before, but as time went on those early advantages were gradually lost. During the past few decades the culture of some crops has become increasingly difficult and unreliable, with a serious falling off in average yields. That has been the result of a variety of causes, including loss of soil fertility, decadence of the original varieties, growing trouble with diseases and pests, and labour shortages.

These problems should be investigated and solutions found if New Zealand is to reap maximum benefit from the crops sown or planted, to meet her obligations as a primary-producing country in a world which is short of food, and to maintain the horticultural industries in a flourishing and healthy condition, which

can be done only by the constant application of new knowledge in improved practice—the process of “keeping up to date.”

A prosperous horticultural industry requires teamwork between grower, advisory officer, and research worker. A team in which one member is weak, or in which any two do not make full use of the third, is badly balanced and does not achieve maximum results. The aim of the Dominion Horticultural Station will be to co-ordinate all the knowledge on the subject and ensure that it is available readily to all growers.

Long-term Programme

The station will ultimately be staffed and equipped for the investigation of fundamental problems of horticulture on a long-term programme, and also to deal with the day-to-day problems of the commercial growers of vegetables, small fruits, and flowers. In addition to carrying out these investigations, the station will serve as a centre where the recommendations of the Plant Diseases Division, Department of Scientific and Industrial Research, can be demonstrated on a field scale to growers.

As an example of the type of work which will be undertaken at Levin, an investigation has already been started into the causes of the present low yields of many commercial raspberry plantations, coupled with the planting of extensive trials of the best varieties at present available in New Zealand. In a few years this work should go a long way toward increasing raspberry production to the point at which there will be enough of this popular fruit for all who wish to buy it. Variety trials of black currants have also been planted up with a range of material from various sources.

Among other work to be undertaken are investigations into the use of modern mechanical irrigation equipment; trials to determine the effects on soil conditions and yield of various cultural treatments; comparative trials of existing and new varieties of vegetables; and a study of methods of increasing the dry-weight yield of flower bulbs grown for bulb production.

I confidently expect that the work of the Dominion Horticultural Station will be of great benefit to commercial growers, home gardeners, and the general public. Commercial growers will face the future with greater confidence if they know that their own technical knowledge of the industry can be supplemented when necessary by an adequate research organisation with facilities to investigate any new problems.

E. CULLEN,

Minister of Agriculture.

MAORI FARMERS' EFFORTS IN INCREASING PRODUCTION

AFTER travelling over most of the North Island a committee set up by the Native Department to discuss with Maori farmers various ways of increasing production in connection with the Aid for Britain campaign recently returned to Wellington, having received the full assurance of the Maoris in all the districts visited that special measures were being adopted to give the maximum support to the campaign. In most areas tribal committees have undertaken the responsibility of organising the drive, which the Maoris are supporting with the enthusiasm that has characterised their efforts in all times of national emergency and particularly their work during the war.

MAORI dairy farmers are stepping up production with the aim of increasing output by 20 per cent. Though favourable seasonal conditions have had a marked bearing on the position, the higher level of output is being reached already in several areas. If favourable conditions continue throughout the season, it is hoped that the target will be reached. Along with other farmers, the Maoris realise the importance of supplementary feed at critical times, and provision for sufficient acreages is being made.

Increased Cropping Areas

Increased cropping areas are also expected to play a part in raising fat stock production in east coast districts. Swedes chiefly are being sown to provide feed which it is expected will raise materially the carrying capacity of the farms. The sowing of swedes will also be a factor in pasture re-establishment on areas where grass is at present showing a tendency to run out.

For pig meat, increased production of which is vitally necessary to meet Britain's demands, a definite target has been set in several districts. Emphasis is being placed on the raising of baconers for export, and baconers are to be reared in some districts where it has not been the practice before.

The Maoris pointed out to the committee which visited them that there

were difficulties in increasing maize production, stressing the fact that on the light Bay of Plenty soils consistently-heavy cropping with maize to meet wartime requirements had been a serious drain on the land. In some cases it has been decided to turn the land over to other cropping this season. However, intensive efforts will be made next season to increase maize production. The Maoris plan to break in new land for the purpose—a step which it was too late to take this season. Plans have been formulated by the Native Department to have machinery available if possible to assist Maori farmers in preparing these new blocks.

The light land which may have to be turned over from maize to other crops will still be providing a very useful contribution toward essential production and will help to raise kumara, potato, pea, and other acreages.

Vegetable Production

Maori farmers are to assist in increasing vegetable production and it is expected that the area of peas grown in Poverty Bay, Wairoa, Hastings, and parts of the east coast will be substantially greater than in any previous season, assisting both the canning industry and supplies for local markets. Growing peas for seed is to be undertaken by Maori farmers in suitable areas.



[National Publicity Studios photo.
Maori farmers planting potatoes on a Hawke's Bay farm.

The Maoris have also indicated that they intend if possible to make themselves self-sufficient in foodstuffs such as vegetables, realising that this has an important bearing on New Zealand's over-all production and surpluses for export.

In a different field—the fertiliser industry—Maoris are assisting the drive for increased production. Many are now employed in the works, which are better equipped with labour to handle farmers' needs this season than last.

JULY COVER

Correction and Apology

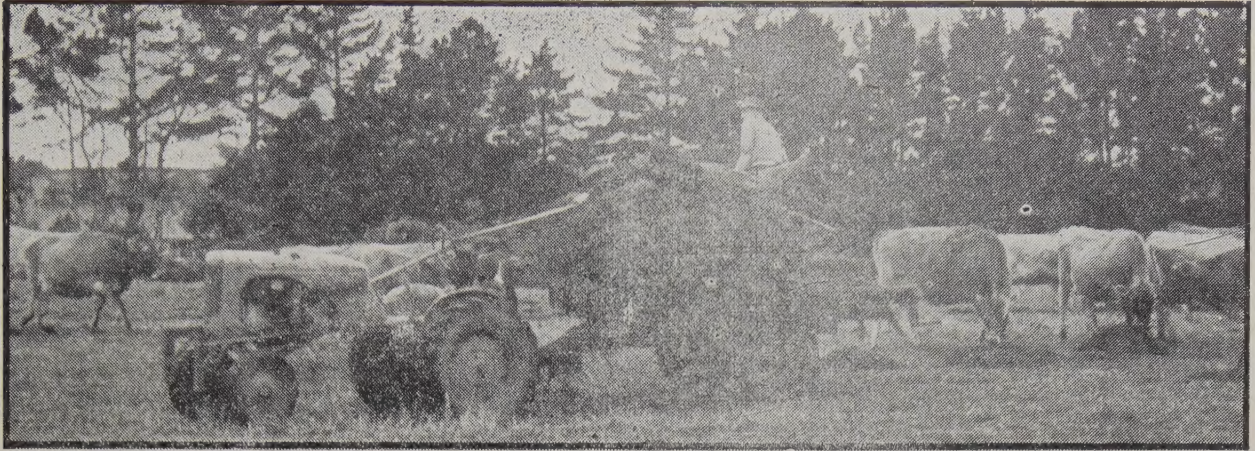


IN the paragraph appearing under the above illustration on page 1 of the July issue of the "Journal" the impression given was that the painting of the cover of that issue was the original work of L. C. Mitchell. This was incorrect, as the cover was painted from a photograph supplied by courtesy of White's Aviation Ltd., Auckland.

The Department of Agriculture apologises for this error and regrets that the acknowledgment of this photograph was inadvertently omitted.

"LOSS CAUSED BY BRANDING FLUIDS"

IN the third paragraph of the article "Loss Caused by Wool-branding Fluids which Will Not Scour Out" on page 397 of the October issue of the "Journal" it was stated that "provision was also made for an alternative to the wool-mark." This should have read "an alternative to the earmark." The wool brand or mark is the principal brand (except in those districts specifically exempt from wool branding) and, as clearly stated in the article, it is used in conjunction with any one of the following (i) an earmark; (ii) a metal ear-tag; (iii) a tattoo mark on any part of the skin; (iv) a fire mark on the horn or face.



THE MAKING OF STACK SILAGE

By A. C. BURGESS, *Instructor in Agriculture, New Plymouth.*

THE value of silage as a winter feed for dairy cows cannot be over-emphasised, and the importance of silage making in the efficient management of pastures should be realised by every dairy farmer. Pastures grow more feed than stock can use in spring and early summer, and feed production from grass falls off very quickly in late summer and autumn and is so small during the winter that extra feed has to be supplied to keep the cows going, even though they are dry. In New Zealand half of the yearly growth of a pasture is produced in October, November, and December, and about two-fifths of that growth is not required then by the herd. This surplus should be cut and stored. Once grass is allowed to get away too much, especially if it goes to seed, much of its food value is lost and its growth slows down considerably. The successful saving of the surplus spring growth and its use for winter feed have always been the aim of the dairy farmer, and that is where silage making, and especially stack silage making, plays an important part in spring pasture management.

AT any other period of the year stock can be used to control growth of grass, but to control the spring flush the mower is essential, and no better use can be made of the grass that is not needed than to make it into silage. Closing up of paddocks for silage should begin in late September or early October, and the first cut should be made when the grass is still young and leafy, just when flowering begins. If the weather is suitable paddocks closed later may be made into hay, but if not, it is wise to cut them and put them into silage rather than allow them to become too mature even for good hay.

Place in Pasture Management

In a district such as Taranaki, where suitable haymaking weather cannot be depended on until early February, more concentration on making good silage from grass at different stages of growth, rather than maintaining a hard-and-fast rule of making hay, would result

in better management of the pastures and better feed for the herd in the winter. The shutting up and cutting of pastures for silage and hay are primarily a pasture management operation, and if that is kept in mind, better results will be obtained.

A crop of hay cut very late may give the pasture a severe setback from which it may take a year or more to recover, and effects of continued cutting for hay off one paddock may be drastic. Therefore, it is very important that the grass crop should be cut so that least harm is done to the pasture, and if that means cutting for silage rather than waiting for hay-making weather, there should be no hesitation. Many late-cut hay paddocks never recover fully after cutting, but paddocks cut early for silage seldom show any bad effect after Christmas.

Value as Stock Food

Though silage is sometimes stated to cause digestive upsets in stock, and

therefore to be responsible for such troubles as mastitis, well-made silage is perfectly safe and is one of the most valuable foods. Losses of food constituents are small, and the silage is very nearly as high in food value as the crop from which it is made. It is highly digestible, rich in protein, and excellent for milk production. In seasons when feed is short it will sustain cows in full milk during the late summer and autumn, and is unsurpassed for feeding to newly-calved cows in the early spring until grass comes away. Young stock require a constant supply of rich protein food to maintain steady growth, and when grass is scarce there is no better food for that purpose than good-quality silage. Its value as a winter supplement for dry stock needs no emphasis.

Silage is essentially a succulent fodder, and therefore it does not replace hay but should be fed with hay if necessary. On farms where pastures are fully improved it should be possible to cut sufficient hay and silage to supply all the winter feed required, and thus the making of silage will obviate the necessity of ploughing up an area for roots. Further, unless the pasture is being ploughed up for renewal, silage is a much cheaper form of winter supplement than roots and the food value an acre is greater.

Principles of Silage Making

In view of its importance on dairy farms, all farmers should know something of the process of silage making so that the reasons for carrying out the method of conservation correctly can be fully appreciated.

Freshly-cut grass continues to live and breathe for a short time, which results in the oxygen of the air combining with the starch and sugar of the grass to form carbon dioxide and water. Heat produced at the same time permeates the stack. Therefore, the more air that is allowed to remain

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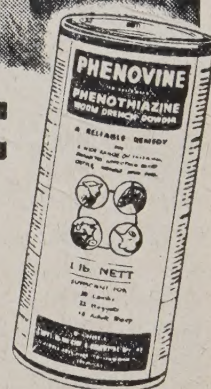
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GRASS FOR STACK SILAGE

in the stack the more will the stack heat. Young, leafy material, which will pack more closely than older, more stalky material, will not heat up so much when stacked. The more stalky the material, the quicker it should be stacked and consolidated to exclude air. If the temperature rises too high the food value and digestibility of the silage are lowered.

During the curing of silage, micro-organisms present in the material act on the carbohydrate of the crop, and their action is important in determining the type of silage produced. That action is exerted through organic acids, the production of which depends partly on the type of organisms present. If the temperature is kept low in the stack or pit through very little air being present, organisms known as *Clostridium* will be the main ones produced. These attack the sugars in the plants and convert them into butyric acid, which is the acid present in rancid butter and responsible for the offensive smell of sour silage.

Where some air is present the *Clostridium* type of organism cannot thrive and another type called *Lactobacillus* will predominate. It acts on the sugars in the same way as the other organisms but produces lactic acid, which has little smell but a sharp, acidic taste. By regulating the rate of stacking according to the condition of the crop the correct conditions can be brought about.

Advantages of Stack Silage

Building a silage stack properly is a task that every farmer should be able to do well. There can be a tremendous amount of waste if the stack is badly built, but in a properly-built stack, made with young material and well covered, the waste material should be only a few inches on the outside and an inch or two under the earth covering.

There are many advantages of making silage in a stack rather than in a silo or pit:

1. If a pit or silo is used, the amount of silage made is regulated by the size of the silo, whereas the amount of spring feed available for cutting may vary considerably from one year to the next. Every attempt should be made to cut all the available surplus, as it will be needed in the following winter and early spring.

2. The silage can be made in any paddock required to be shut up, which saves carting the material to a pit which may be at the other end of the farm.

3. Though silage can be cut from the same paddock for some years without much ill effect, it is better to change the paddocks cut regularly. That can be done conveniently only if the silage is made in a stack in the paddock that is harvested.



A two-horse grass mower in operation.

4. If the silage is made in a stack, the cost and work involved in constructing a silo or preparing a pit are avoided.

5. If a paddock is shut up for hay and the weather prevents haymaking, silage can be made and a stack built on the spot.

6. As most silos or pits are built near the edge of a bank, the pull away from the pit with a load usually has to be made up hill, which is hard going, and feeding out in wet weather is made more difficult than ever.

7. When a pit is used, the silage is usually fed out in paddocks nearby, and these are always severely cut up in the winter, opening them up and allowing weeds to come in.

Shutting Paddocks

The paddocks shut up for silage should be those which will give a good yield of green material and which will recover quickly after cutting. They should contain a good proportion of clover, which is essential in the sward to stimulate a good leafy growth of grass. Shutting up for silage has the same effect as shutting up for hay—that is, clovers are smothered and the sward is likely to open up and allow weeds to come in—but if the pasture is good and cutting is done before the grasses have seeded, the effect is not marked. Therefore, silage can be made from the same pasture for a number of successive years without much ill effect if care is taken, but that practice should be avoided if possible.

Pastures, especially permanent pastures, to be cut for silage should be shut early to obtain the full benefit of the spring growth, and it is often wise to shut up the silage paddock while

feeding out is still in progress. Farmers who make good silage year after year are those who close their paddocks on a certain date even though feed may still be short. Even in a late spring, this practice of shutting paddocks on, say, September 20 has the advantage that the pasture benefits from any good growing weather, whereas if shutting up is delayed until the spring flush, it may be mid-November before it is done, and the crop will probably be light and recovery after cutting much slower if dry weather comes.

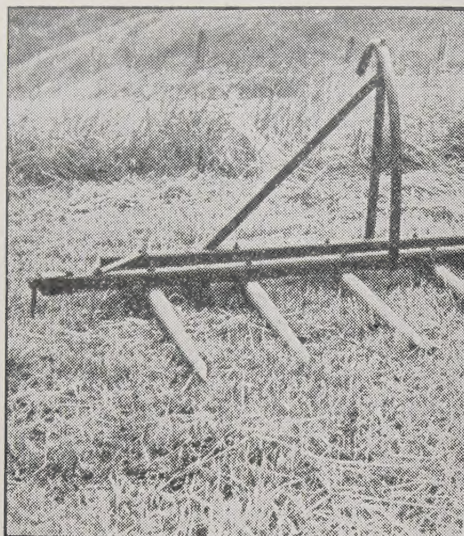
To give the pasture extra stimulus to start growth early, a light dressing of superphosphate and potash (if good results are obtained by the use of potash) should be given in the spring in addition to the normal autumn top-dressing.

Cutting the Crop

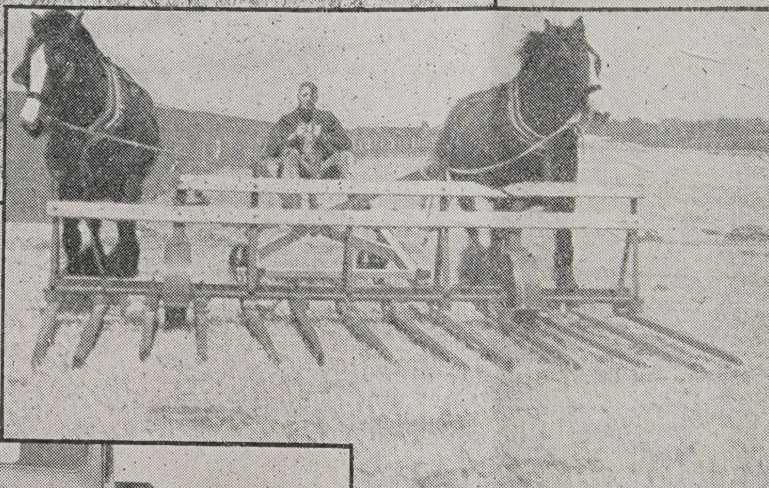
The first essential in making good silage is to cut the crop at the correct stage of growth. Grass in the young, leafy stage is high in digestible protein and rich in minerals and vitamins, which are all essential for growth of young animals and high milk production.

As soon as the plant begins to flower the proportion of protein decreases and the proportion of fibre increases rapidly. At this stage the feeding value of the crop is at its highest level. Grass cut earlier is of higher feeding value, but the yield is much lower and its use may result in sour silage. Later cutting results in a greater bulk of fodder, but with much higher fibre content and lower food value. Early cutting also ensures good recovery, which should be assisted by giving the

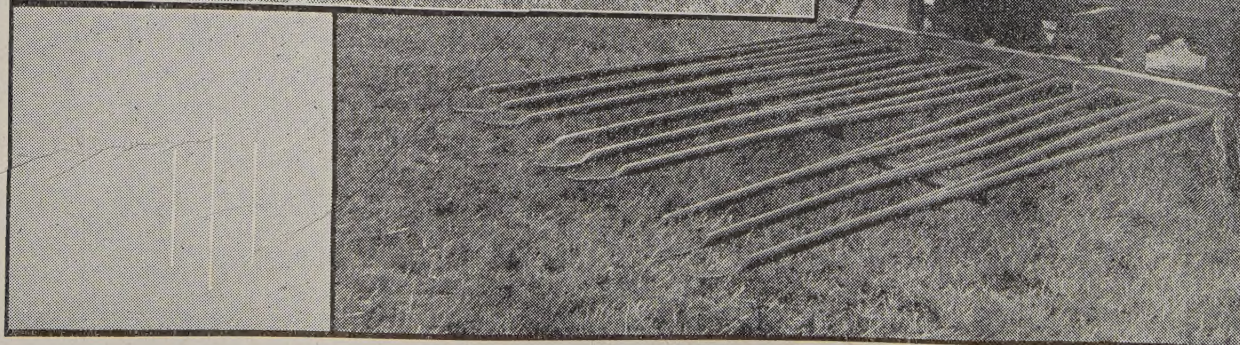
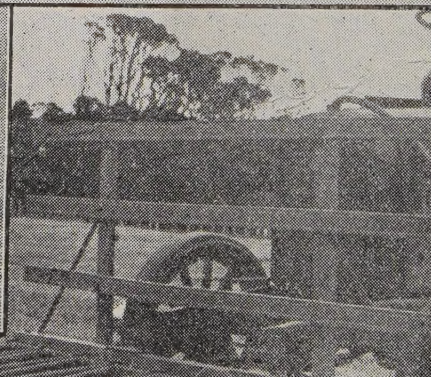
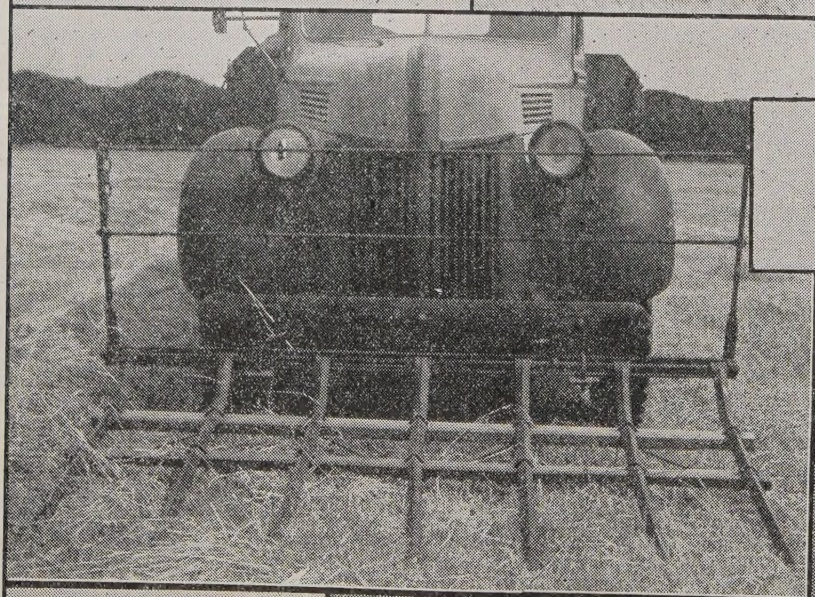
TYPES OF SWEEPS



ABOVE—A ONE-HORSE TUMBLER SWEEP. RIGHT—A TWO-HORSE SWEEP OF THE WHEELED TYPE.



LEFT AND BELOW—AUTO SWEEPS, THAT BELOW HAVING TINES IN THREE INDEPENDENT SECTIONS TO CONFORM WITH UN-EVENNESS OF GROUND.



pasture a good topdressing early in the autumn.

Pasture should therefore be cut just when the main grasses are coming into flower. Lucerne should be cut when new shoots begin to appear at the crown.

Care of the Mower

Grass mowers of various makes used in New Zealand for cutting crops for both hay and silage are of a standard type. The machines are drawn by two horses and the cutting mechanism extends to the side, consisting of a knife made up of a number of pointed sections moving backward and forward between fingers which gather in the grass as the machines move along. These machines are very efficient, and a man can mow about an acre an hour with a good machine and good horses.

It is essential that all harvesting gear, especially the mower, be in good working order before cutting is begun. A mower should always be put in a waterproof shed at the end of the season, and before use again should be checked to see that the oil in the gearbox is clean and up to the required level, that all working parts are well oiled, that the knives to be used are in good condition, and that the fingers on the knife bar are not bent, otherwise the knife will not work freely. Finally pole straps which buckle on to the horses' collars should be examined to see that they are in good condition. Every care should be used in operating the mower, and it should never be left in gear when the driver is off his seat. Many accidents have occurred through farmers stepping off the machine, walking in front of the knife, and pulling away an obstruction while the mower is still in gear.

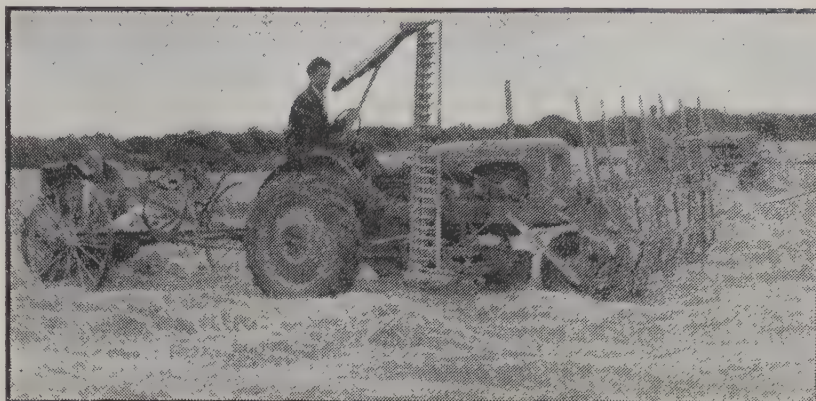
With the introduction of tractors for harvesting, power-driven mowers are becoming common. Many tractor manufacturers supply a grass-mower attachment which is driven off a power take-off on the side or at the back of the tractor.

Carting in the Grass

Early equipment used for carting in grass to stack for silage or hay consisted of a horse-drawn sledge or cart on to which the grass had to be forked. At the stack it had to be forked again and, especially with green grass, it was a very tiring and slow task as the stack grew higher.

The idea of pulling the grass into the stack was soon evolved, however, and the first method used was to rake the material into cocks and pull the cocks in by means of a rope, the ends of which were fastened to a swingle-tree placed low round them. From that horse sweeps were developed, and one of the earliest of them was the gate sweep, consisting of two side wings, gates 4 to 6 ft. long by 3 ft. high, hinged

HARVESTING GRASS FOR SILAGE



A tractor-drawn harvesting unit with mower and sweep folded for transport.

to a central gate about 10 ft. long. One end was attached permanently to one swingle-tree, the other end could be detached and closed round the cock or heap, hooked to the swingle-tree again, and the load pulled in. At the stack the sweep was again detached at one end and pulled clear of the load.

The one-horse tumbler sweep then became popular and is still widely used. It consists of a beam about 8 ft. long with six or seven fingers, 3 to 3½ ft. long, projecting from it. The fingers or tines are of hardwood timber, 3 in. by 2 in., usually with pointed steel tips. Beneath the base of two of the fingers are hardwood skids or runners, which help to balance the sweep and give the fingers the necessary deflection. Fitted and braced to the beam are two handles of ½ in. galvanised piping curving backward. By lifting the handles the sweep can be tipped over and the load dumped. The advantages of this sweep over previous ones are that the grass can be swept in directly from the swath without first having to be raked into heaps, and the sweep can be unloaded without stopping the horse.

Various types of horse sweep have been evolved, all having fingers or tines, but differing from the tumbler sweep in their method of depositing the load. The two-horse finger-type sweep was similar in structure to the tumbler but was wider and had one shaft fitted to the beam on each side. A horse on each side pulled the sweep, and when the load was to be deposited the horses were backed, leaving the load on the ground. The wheeled sweep, though similar in action to the finger type, was pushed by two horses hitched up behind it instead of at the side.

Wheeled sweeps were really the forerunners of the auto and tractor sweeps which now are probably used more than any other type. An auto sweep is fitted to the front of a car,

truck, or tractor and usually has 6 ft. steel tines made of 1½ in. by ½ in. angle iron. The tines are 12 in. apart and are secured by U bolts at their bases and at the centre to two wooden beams, the base one of 3½ in. square timber and the other of 2½ in. by 1½ in. The two beams are cross-braced with steel and each tine is braced to the front beam with ½ in. round steel. To the back beam are bolted two 3 ft. uprights of 3 in. by 1½ in. timber, carrying cross pieces of 2½ in. by 1½ in. timber at the top and centre. A common size of sweep is 7 ft. wide with eight tines; some are 8 ft. wide with nine tines. The sweep is carried in front of the vehicle on braces fitted to the body. On some modern tractors with only one front wheel the beam of the sweep is braced by rods fitted to the rear axle. Sweeping in the green material has been greatly speeded up since the introduction of auto sweeps.

Before sweeps became so widely popular, the grass loader or elevator, which obviates the necessity for forking material on to the cart, was used to some extent. The machine has an endless canvas blind moving round a frame about 10 ft. high, set at an angle to the ground, and is drawn by a truck or tractor. Fingers pick up the grass from the swath and it is carried up on the canvas and deposited on to a trailer behind. Two men are required to operate this outfit, one on the tractor and one spreading the load on the cart. It is slower bringing in the material than a tumbler sweep and therefore, except for long hauls from one paddock to another, it has been replaced almost entirely by the sweep.

Stacking Equipment

Stacking for silage has been made much easier by the introduction of the mechanical stacker. This piece of machinery is probably the most important used in building the silage stack, for it has done away with the

STACKING FOR SILAGE . . .

heavy work of lifting the green material on to the stack by hand—in fact, the only forking now required is by the men doing the building. All the stackers in general use, though varying considerably in design, pick up the material from the ground after it has been brought in by the sweep, lift it up, and dump it on the stack.

The most popular type is the grab stacker. A mast or pole is supported by stays or guy wires, and attached to the mast moving round it is a boom or arm. A wire rope, to one end of which a horse is hitched, runs through a pulley at the base of the mast, up the mast through another pulley at the top, and then through a pulley at the far end of the boom. To the free end of the rope is attached the grab, which can be raised or lowered by moving the horse forward or backward.

A well-known stacker of this type consists of a tubular steel mast 19ft. high secured at the base to two wooden "feet" 12ft. long set at right angles to each other. The mast is braced to these "feet" by two tubular steel stays bolted to the top, and only one guy wire is used; other types are similar in principle but are braced by guy wires. The boom, also of tubular steel and 17ft. long, is attached to the mast and is set at an angle from it. The boom can be moved up or down

the mast according to the height of the stack.

The grab is about 3ft. high by 3ft. wide and consists of two sets of curved steel prongs hinged at the top and pointed at their free ends. The wire rope is attached to a hook on the grab and to this hook a small chain runs to the prongs on each side. Thus when suspended the grab hangs open. When in use the grab is lowered to the ground and the men operating it push the points well down into the grass, which the sweep will have left in a heap near the stack. With a locking device, which can be released by a light trip rope operated by a man on the ground, the prongs are locked and the loaded grab raised to the required height.

Two men on the grab are an advantage. They both help in loading up the grab. By a rope attached to the frame one pulls the grab round, after it has been raised to the required height, until it is above the point on the stack where the load is required. When the signal is given by the stacker, the other man pulls the trip rope and the load is dropped. Such a stacker is easily operated and is efficient if the men leading the horse and operating the grab know their jobs.

Another type of stacker, very little used now, is the elevator, operated on

a similar principle to the elevator loader. It is much higher and stands at the side of the stack, where it is driven by a belt from a truck or tractor. The material is forked on to the revolving canvas, carried up, and deposited on the stack. The big disadvantage is that the green material has to be forked at the bottom and more forking is necessary on the stack.

The platform stacker consists of a platform similar to a pronged sweep fixed to a frame. It is pivoted on a base about 12ft. high standing on the ground. A wire rope passes through a pulley on the base and one attached to the end of the frame, and the free end is attached to a horse or tractor. When the horse moves up, the end of the frame is pulled down and the platform on the other end of the frame is raised. When high enough it is swung round, the teeth of the platform dropped by a release operated from below, and the load discharged. The advantage of these stackers is that the material can be swept right on to the stacker if a wheeled or auto sweep is used, but they have the disadvantage of being able to dump their load on only a limited area of the stack, requiring more forking by the stackers.

The most efficient equipment for cutting and stacking grass for silage consists of one tractor-drawn or two horse-drawn mowers, an auto sweep or two horse-drawn tumbler sweeps, and a mast-and-boom stacker with one man or boy leading the horse, one or two more on the grab, and preferably three men on the stack. That means a maximum of 10 men, though most often the man mowing starts early, cuts a block, and then works on the stack. An efficient gang of seven—one cutting, one sweeping, a boy or woman on the horse, two men on the grab, and two on the stack—can stack 3 or 4 acres between milkings.

Site and Size of Stack

When operations are to be started the first decision must be the site of the stack. A suitable site is most important, as a badly-selected site can result in the waste of a large proportion of the material. The position should be well drained, and care should be taken that no water will lie in the vicinity in wet weather, as that will make feeding out more difficult. If the site is exposed to the prevailing wind, great difficulty will be experienced if a wind should spring up during building operations and the stack may tip over. It is more convenient to build the stack somewhere near the centre of the paddock if possible so that long hauls will be avoided when the material is being swept in.

The site for the stack being decided, sweeping is begun and an area cleared



The horse has raised the grab, from which the material is falling on to the stack.

BUILDING A SILAGE STACK

for the erection of the stacker. Before deciding the size of the stack to be built, the amount of material to be handled must be known. The average yield of green material for silage can be taken at 6 to 7 tons an acre and a very heavy crop may yield 10 tons. Each ton of green material giving about two-thirds of a ton of silage. When settled completely a stack should be 6 to 8 ft. high. A cubic foot of silage weighs 40 to 45 lb. From those figures the size of the stack to be built can be estimated.

Stacks containing only 20 to 25 tons of material are frequently built with a base about 20 ft. in diameter, resulting in the final stack being only 3 or 4 ft. high. The proportion of waste in such a stack is high because of the large surface exposed compared with the bulk of material. The following sizes can be taken as a general guide:

Amount of Green Material (tons)	Diameter of Stack (feet)
20 to 30	14 to 16
40 to 60	20
70 to 80	24
90	26
100 to 110	28 to 30

These figures all refer to round stacks. Rectangular stacks are built very occasionally, but the round stack is best because there is less waste, the area exposed to the air being less. Holding the earth on a rectangular stack may be easier, as poles or wood can be placed along the edges and fastened at the corners, but if a round stack is well earthed settling is more even.

With finger-type sweeps, raking the material is not necessary and it is, in fact, better to sweep straight in from the swath, though the side-delivery rakes sometimes used make sweeping easier. If the material is left in the windrows too long it is more likely to heat.

In building a stack, care should be taken to see that the material is properly spread out, and that the sides are kept straight and the centre well filled. Though the ultimate aim in building a silage stack is to carry out the operations so that the temperature is controlled within certain limits, a thermometer is now seldom used. Experienced builders know by the type of material how to build the stack so that the final product will be of the desired type.

Cutting and Stacking

A sound plan is to arrange the cutting and stacking so that the work is spread over four days.

On the first day one third of the paddock is cut, and if the base is the right size, a stack 7 to 8 ft. high of green material can be built in five to six hours—the average time between milkings. The correct building of the stack right from the bottom so that it



Turves placed round the edge of a silage stack to retain the earth.

will be straight and will settle evenly is very important. Building a silage stack is something like building a stack with wheat or oat sheaves. One man should be responsible for building the outside edge, and the material should be forked to him by a "crow" so that the builder can work round the edge all the time, placing the material and seeing that it is tramped firm. Also similarly to the cereal stack, after each outside ring is built, keeping the sides straight and firm, the centre is built up and kept firm. The builder should walk on the outside edge of the stack as much as possible during building. The centre should not be much higher than the sides except at the end of the day, when it is well hearted up.

On the morning of the second day the temperature of the stack near the top should be about 90 degrees F., at which temperature grass feels pleasantly warm. If the temperature is much below that, a spell of a day, or perhaps two days with young, leafy material, should be given.

On the second day one-third of the remaining grass is cut and should be added between 5 and 6 ft. of new material to the stack. On each of the third and fourth days another 5 to 6 ft. of green material is added. If the time taken to bring in and build this material on the stack is five to six hours, it will be found that the stack will be maintained at the correct temperature and that the stack will gain in height about 2 ft. a day, so that a stack built to about 8 ft. the first day will reach about 14 ft. in height after three more days.

If the stack is increasing in height too fast during building, it is probably not heating sufficiently and a spell of a day or two should be given. If the stack is settling more quickly and not gaining 2 ft. for each 5 to 6 ft. of green material added, the stack will be heating too much and stacking should be speeded up. The material should be spread out flat on the stack and not left in heaps, as that will cause overheating because of too much air being retained.

When the material being stacked is more mature and coarse it will have heated enough by the morning after the first day's harvesting, and therefore no spell should be given and the quicker the remainder can be stacked after cutting the better it will be when cured.

When the stack is completed it should have a good heart with the top 3 to 4 ft. above the eaves, but the stack will settle until finally the centre is only about 1 ft. higher than the sides. A stack left uncovered should be hearted up even more so that the top is 4 to 5 ft. higher than the eaves when the stack has settled completely.

Covering the Stack

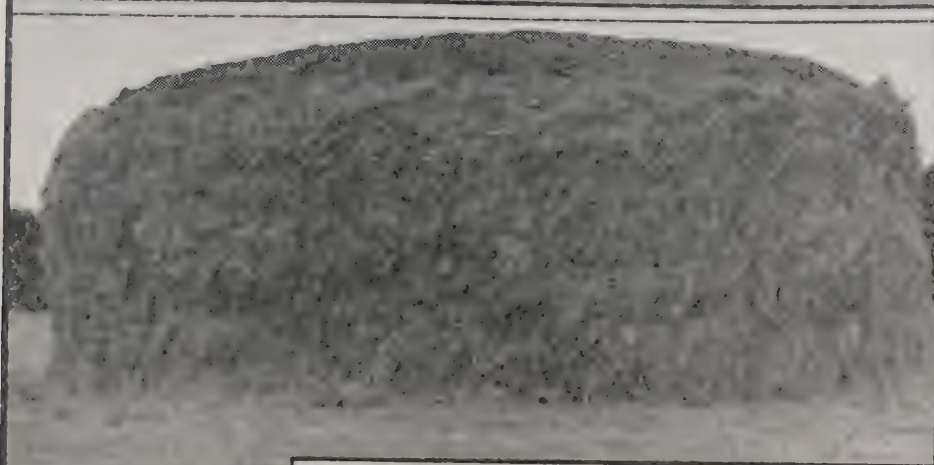
Good, even consolidation of the stack is necessary for the exclusion of air. If the material is leafy, keeping the air out is not difficult and therefore there may not be much extra waste if the stack is not covered. If the material is at all mature, however, some cover is essential to provide a seal for the top and to give the weight necessary to consolidate the mass

SILAGE IN STACKS

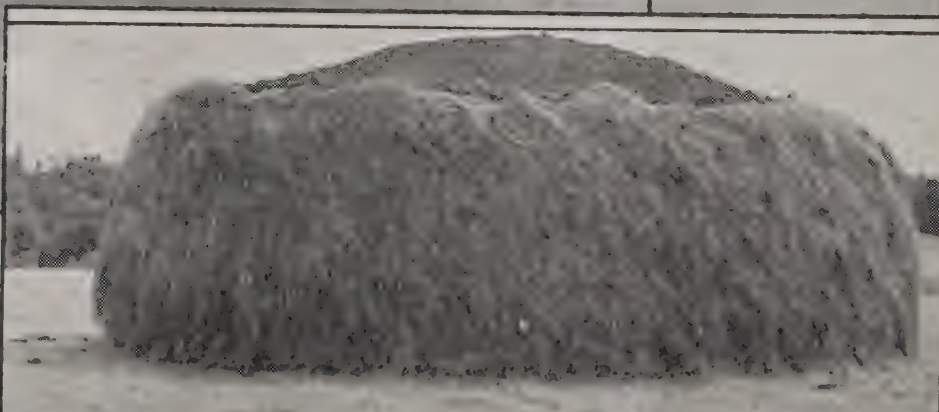
Right—A well-covered stack of silage.



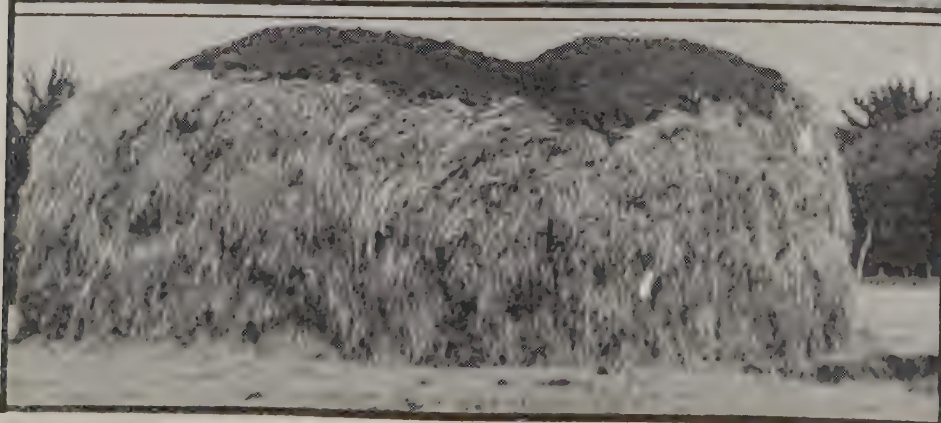
Left—Well built and evenly covered, but earth not quite near enough to the edges.



Right — Sides are not straight enough and the covering is weak at the edges.



Left — This stack has sunk badly after being covered; the centre was not sufficiently consolidated.



BUILDING OF SILAGE STACKS



Two uncovered silage stacks. That on the left is well heaped up, but that on the right is too flat on top.

quickly; if no cover is provided, the waste is out of all proportion to the time saved. The area of pasture damaged by digging the hole is small in comparison with that damaged by the stack itself and is not an important consideration.

The earth should be put on as soon as the stack has been built. The covering can be applied fairly simply with the use of an old milk can for lifting the earth to the top of the stack. The grab is removed from the stacker rope, a swingletree attached in its place, and chains hanging down from each end of the tree hook into the handles of the milk can.

Earth for covering the stack is usually obtained from a hole dug at the side of the stack. First the turf should be lifted and may be placed grass downward round the top edge of the stack. Earth is then dug from the hole, the can filled, raised, and emptied on the stack, and the material spread evenly over the top. The turves prevent the earth from slipping off the stack. However, that is not the best form of retainer for the earth covering and many others are used. Wire netting may be placed in a ring round the top of the stack, lined with turf, and the earth then filled in. Where available, rushes placed butts outward make a good retainer. Frames of wood round the edge of the stack used to be very popular and are very efficient; 4 or 6 in. by 1 in. boards about 3 ft. long are wired together to form a circle just fitting round the edge of the stack and the earth is filled in in the centre.

Whatever means is adopted, the aim should be to get the earth on quickly and ensure that it is as near the edge of the stack as possible and that it will stay there for as long as it is required. Earth is the most suitable covering, as it forms a seal on the top. Lime is

often used in place of earth and appears quite satisfactory. A good even cover of between 6 in. and 2 ft. of earth is necessary, depending on the type of material in the stack and how it has settled during stacking.

A stock-proof fence should be erected round the stack as soon as building and covering have been completed.

Feeding to Stock

The colour and feeding value of silage depend on the nature of the material when stacked and conditions during curing. Young, leafy material well cured is a light yellowish-brown with a slightly acid smell. Toward the bottom of the stack the silage is greener and may have a rather stronger smell, which is, however, quite agreeable. These types of silage are of good feeding value and are relished by stock, but hay should be fed with them unless there is some mature grass or other roughage available. A milking cow in a dry summer, in autumn, or in early spring requires from 10 to 60 lb. a day, according to the amount of grass available, and if the silage is good she will maintain her milk supply. About 20 lb. a head daily during the winter will keep young stock in thriving condition.

Occasionally, when very young, wet material is stacked without any spell to allow the bottom of the stack to heat, the bottom few inches of silage may be sour. Such material has a very offensive smell, is not eaten readily by stock, and may upset their digestion. However, sour silage is uncommon in stacks.

Much more common is the dark brown or black, sweet silage caused by overheating in the stack. It is very likely to occur when mature grass is harvested. The heat evolved destroys

a large proportion of the carbohydrate and causes a marked decrease in the digestibility of the protein. This burnt silage is not a good milking food and is really suitable only as a maintenance ration for cows. It should be fed only to dry cows in the winter, when 20 to 30 lb. a head daily will keep them in good condition. This material will replace hay.

When cows are coming near to calving, however, they should be fed good silage for the last two or three weeks. Cows calve and clean up better if fed in that way than if they are fed only hay or mature silage right up to calving.

An Ensiling Programme

Farmers in dairying districts know only too well the difficulty of making good hay because of unsuitable weather at harvesting time. Very often a dry period cannot be relied on until February and hay cut when it is ready will be spoilt by rain. In most seasons a system of making silage of the different types of grass would result in the saving of more feed for winter, with little if any more waste in food value and less time spent on the job.

A programme somewhat as follows could be adopted:—

1. Paddocks closed up in mid- to late September would be cut in early or mid-November. This material, being very succulent and high in protein and mineral content, would be ideal food for milking cows in a dry summer period or in the autumn or early spring. It could also be used for young stock.
2. Material cut between late November and mid-December would still make good silage. It could be fed to milkers if required, but otherwise to springers and dry cows.

THE MAKING OF STACK SILAGE



The penalty of an unfenced stack—silage wasted by being trampled around the paddock.

3. The material which is allowed to go to the more mature stage could be made into hay if the weather was suitable, but, if not, should be made into silage. If cut and stacked with a minimum of delay, well consolidated and well covered, losses should not be excessive. In no case should cutting be delayed too long in the hope of an improvement in the weather.

Future of Silage

Almost certainly silage making will continue to play an important part in dairy farm management unless such a process as grass drying on a large scale becomes practicable for the average farmer. That leads to the question: "Is the present system of making silage satisfactory, or is it possible that modifications will be introduced that will reduce losses in curing?"

Much work has been carried out overseas with the addition of substances to produce conditions which will help to bring about the correct type of fermentation and thus produce the desired type of silage. The A.I.V. process, which has been used overseas for many years, consists of adding a mineral acid such as sulphuric acid to the grass during stacking. By adding a known amount of acid to a known weight of grass the acidity can be increased so that normal fermentation does not take place. If the process is carefully carried out, it is

quite satisfactory, but as acids are dangerous to handle and special non-metal containers are necessary, the advantages of A.I.V. silage over ordinary silage are not sufficient to warrant the extra trouble.

The addition of an easily-soluble carbohydrate to crops very high in protein results in the correct type of organism predominating and has given promising results overseas. As the young grass usually made into silage is high in protein, this process might have application in New Zealand. The addition of either molasses or whey is easy and requires no special equipment. Molasses is diluted with about twice its volume of water and sprayed on to the grass during stacking, using 30 to 40lb. to each ton of grass. Ordinary whey is too watery and with very young material may cause sour silage. Whey paste diluted with twice its volume of water and added at the same rate as molasses has given satisfactory results.

The results obtained in New Zealand by officers of the Grasslands Division, Department of Scientific and Industrial Research, have shown that under normal circumstances grass made into silage is sufficiently high in carbohydrates, and the addition of molasses and whey has not effected sufficient saving to warrant the cost and work involved. However, this process is practicable and would make the successful saving of very young, leafy grass far more certain, which would

mean that silage making could be carried out with a wider range of material.

The use of light, portable silos, though not entirely satisfactory in the past, may be able to be developed. The important points are that they must be cheap, easily constructed, and able to effect a considerable reduction in waste.

Without any of the methods mentioned being adopted, there is without doubt room for an improvement in the general quality of silage made. Important points to be borne in mind when working for an improvement are:

Shut paddocks which have good clover and grass, and shut them early.

Cut the grass when it is just beginning to flower.

Build the stack carefully, keeping the sides straight and the centre well filled.

Cover the stack with earth as soon as possible after building is completed.

Erect a stock-proof fence immediately.

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RYEGRASS ATTACKED BY WHEAT SHEATH MINER

By AVICE HAMILTON, Assistant Entomologist, Entomology Division, Plant Research Bureau, Nelson.

RYEGRASS, which has been grown extensively for seed production in New Zealand for several years, is remarkably free from insect attack on its foliage and seed, but one insect signifies its presence by a premature whitening of the seed head. These white seed heads are conspicuous in the green crop, and a small barrel-shaped chrysalid or puparium, resembling the "flax seed" stage of the hessian fly, will be found lying between the sheath and the stem. This insect is known scientifically as *Cerodonta denticornis*, and its common name of "wheat sheath miner" arises from its attacking wheat and barley. In other countries maize, oats, and timothy, as well as various grasses, have been attacked by it.

THE adult fly (Fig. 1), which is about 1/12in. long, is greyish, with yellow legs and one pair of transparent wings. As the life history has not been studied in New Zealand, the following information is taken from work carried out in the United States of America.

In early spring the mature flies begin to emerge from the puparia, and within a few days the females start laying eggs in the blades of the ryegrass. The female fly punctures a leaf, usually near the tip or along the edge, and lays a single egg of microscopic size within the leaf tissue (Fig. 2). A large number of eggs is produced by each fly, as it usually oviposits daily during its lifetime of at least three weeks, averaging about nine eggs a day. Within a week the young maggot hatches from the egg and immediately mines in the leaf tissue. These early mines (Fig. 2) are not readily detected, but as the maggot grows it enlarges the tunnels, which are then easily seen with the naked eye, appearing as white lines on the leaf, often in a zig-zag pattern.

When the tunnels are numerous the flow of sap is cut off and the leaf wilts and dies. Frequently the damage does not cease when the maggot reaches the base of the leaf, for it may enter the tender young stem and cut off the sap supply to the developing seed head. The result of this injury to the stem appears as a white straw in the ryegrass, whereas similar damage to a very young plant takes the form of a browned sheath.



Fig. 1—*Cerodonta denticornis*, adult female.

When the maggot is fully grown (Fig. 3a), which takes 9 to 24 days, according to the time of the year, it comes to rest between the sheath and the stem and enters the resting stage known as a puparium (Fig. 3b and c). However, the puparium is the stage found in the field, as the maggot is usually fully grown by the time the ryegrass head is totally white. The time spent in the resting state is about two weeks

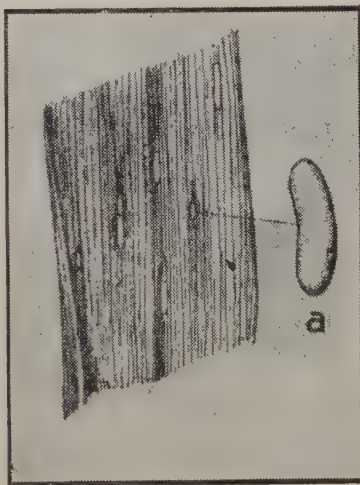


Fig. 2—Section of a leaf blade showing the positions of eggs and young larvae beginning their tunnels; a, the shape of an egg.

during the spring, decreasing as the summer advances. When puparia occur in the autumn they overwinter in this state and the flies emerge in the following spring.

Though the time taken by this fly to develop from egg to adult stage is only a few weeks, there are several broods during a season—at least three, with a great deal of overlapping.

The wheat sheath miner is an introduced insect now distributed throughout New Zealand. Usually this fly is

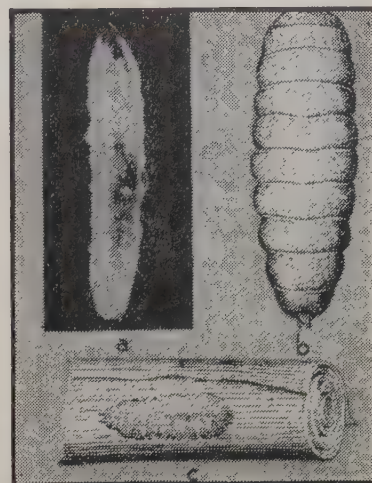


Fig. 3—a, dorsal view of a wheat sheath miner maggot; b, dorsal view of a puparium; c, section of barley stem, showing usual position of puparium beneath leaf sheath.

present in ryegrass crops in very small numbers and is noticed only when the fly population increases. This increased activity takes place periodically and in isolated areas, and so far it is not regarded as a serious pest.

In December, 1944, the Instructor in Agriculture at Rangiora reported an outbreak of the wheat sheath miner in some ryegrass crops in North Canterbury, signified by the sudden appearance of white straws in the field. The extent of the damage varied considerably; in the badly-attacked paddocks the highest estimate of white heads reached seven to eight to the square foot, while other areas showed only about one to the square foot. Puparia were collected and the flies began emerging on December 25. Two years later adults were observed emerging on January 18 from a ryegrass paddock in Hastings.

While a survey of insect pests of wheat crops was being carried out from 1936 to 1938 by L. Morrison, *Cerodonta denticornis* was recorded attacking both wheat and barley, but it was never very prevalent. During that period the fly was collected more readily from crops in Mid-Canterbury than from those in other places. In January, 1944, when wheat straws taken from Methven and Ashburton were examined for a stem-boring caterpillar, puparia were present only in limited numbers and usually in association with the hessian fly.

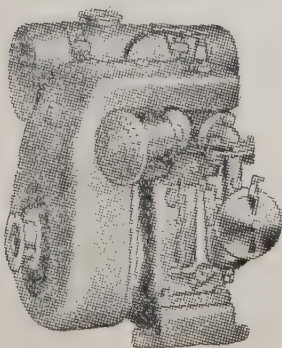
As the winter is passed as puparia, in the spring flies will emerge from old stubble, grass in fencelines, and waste places where the insect has bred the previous season.



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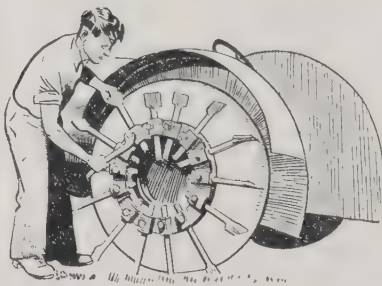
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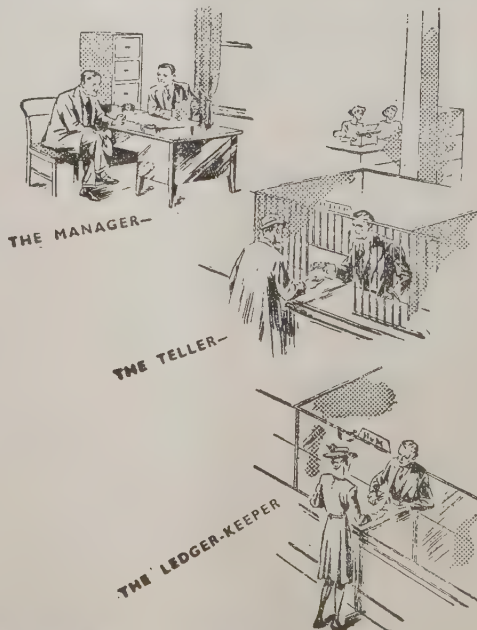
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The Growing of Raspberries from Suckers and Seeds

THE profitability of small fruit crops has always depended on the planting of varieties which would yield heavy, regular crops. In last month's "Journal" J. P. Hudson, Horticulturist, Wellington, showed that each variety should be a separate clonal race, and the clonal question as it affects raspberries is discussed in this article.

RASPBERRIES are, in some ways, the most "temperamental" of all the small fruits. Though a good stock, planted in a suitable area, will even now grow vigorously and crop heavily, no amount of cultural skill will produce paying crops if the area is in any way unsuitable or if the variety is not a heavily-yielding one suitable for the district. The conditions of soil, drainage, and climate most favourable to raspberries are fairly accurately known, and a detailed specification for an area suitable for commercial raspberry growing was given in the November, 1946, issue of the "Journal."

RASPBERRIES FROM SUCKERS

It is all-important that the variety should be chosen with due regard to the district. Far more than most fruits, raspberries seem to be radically affected by local conditions, so that a variety which bears well in one area may be useless in another, even though the soil and climate seem equally suitable. There is at present no single variety of raspberry which can be recommended as worth growing in all districts in the way that a few varieties of, say, apples or gooseberries are likely to crop well wherever these fruits will grow at all.

Varieties Should be Clones

Moreover, the stock of raspberries planted in any particular district must not only be of a variety suitable for the district but must also be a heavily-yielding strain of true clonal material, every cane a direct descendant, by vegetative propagation, from the originally-selected heavily-yielding plant, as explained last month.

Unfortunately, keeping a stock of raspberries clonally true is more difficult than in the case of any other fruit because of the habit of the plant. Every season a completely-new set of fruiting canes must be produced from below ground level. Many of these suckers arise from immediately around the old stool (stool suckers), while some grow from the roots at some distance from the parent plant (root suckers). Most of the stool suckers are retained for fruiting and the root suckers are either destroyed by culti-

vation or lifted and used for replanting new areas.

No matter how carefully the fruit is picked, some ripe ones are certain to fall to the ground or be scattered by birds, and the seedlings which grow from these may be very hard to distinguish from suckers of the true variety. They will not, of course, be mistaken for fruiting canes, as most of these grow from the old stool and are, in any case, much taller and stouter than seedlings, which as a rule grow into only quite short canes, with relatively-thin stems, in their first season. The stools, therefore, usually continue to be true to type, and the plantation may remain in heavy, regular, profitable production.

Seedlings Become Mixed with True Stock

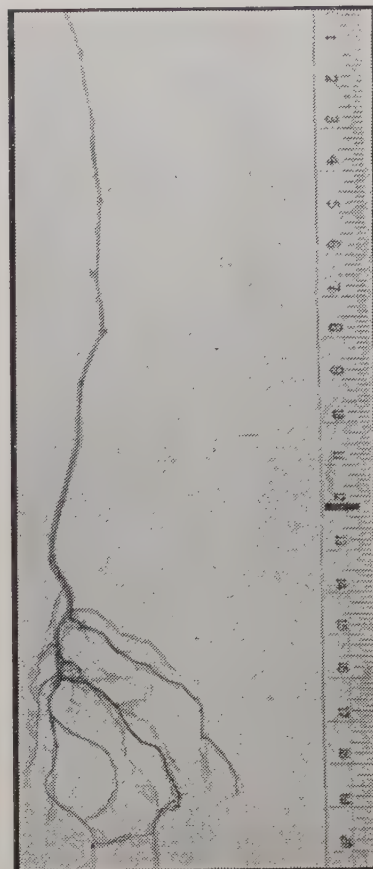
However, the seedlings are likely to be lifted in the winter if the area is used as a source of suckers for planting, and even if not lifted in the first winter, the tops of seedlings may be cut off by cultivation and the roots left in the soil, to produce in the following year root suckers that will be more normal in height and thickness and even harder to distinguish from suckers of the true variety than are the first-year seedlings.

Canes dug in this way from fruiting plantations are no longer true clonal material with a proven record of heavy yields, but contain plants which may grow vigorously yet crop very poorly and are quite incapable of returning regular, profitable crops to the grower whatever cultural steps he may take.

It is therefore quite clear that, once a variety (or local strain of a variety) of raspberries has proved itself in a district, special steps should be taken to propagate true clonal material from it and make this available for planting so that growers can lay down new areas with the confident knowledge that the canes will bear heavy, regular crops provided the area was properly chosen and good cultural practices are followed.

Nursery Beds for Stocks

The only way in which clonal raspberry stocks, free from seedlings, can be produced is by growing them in



A thin, spindly-stemmed raspberry seedling at the end of the first season's growth.

special nursery beds where no fruiting is permitted. All the canes, large and small, are lifted each winter, leaving in the soil sufficient roots to provide a new batch of canes in the following year but no fruiting canes. Any tendency of varieties like Lloyd George to bear autumn fruits on the new canes must be prevented by regularly cutting off flowering trusses as they appear.

Not only does the nursery bed system prevent the growth of seedlings but it also prevents the formation of any perennial root system—"stooling"—as the stool is formed by suckers growing from the base of a former sucker, the root of which becomes enlarged and may live for many years. Stooling may be an advantage in a fruiting area as the stool will develop an extensive and deep system of permanent roots in suitable soils, but root suckers can usually be lifted with more fibrous roots and are much more satisfactory for replanting than stool suckers.

Thanks to the ready co-operation of a number of growers, a start has already been made in selecting the best types of common commercial varieties with a view to testing their fruiting

THE GROWING OF RASPBERRIES . . .

capacities and propagating true clonal stocks of those which yield the heaviest and most regular crops.

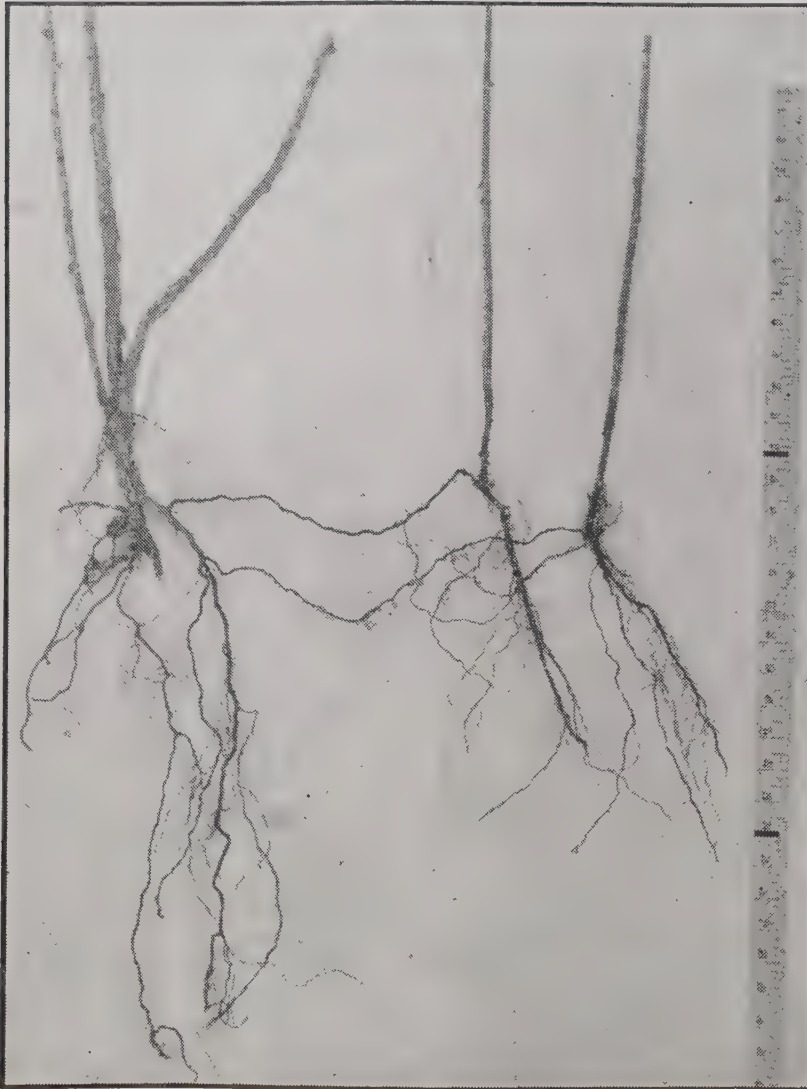
Starting a Nursery Bed

Meanwhile, growers who contemplate planting a small nursery bed for supplying their own requirements of new cane should site it as far as possible from their fruiting beds and make sure that the suckers planted in the nursery are without doubt true to strain and variety. That can be ensured by marking, during the summer, a number of the canes which are bearing the heaviest crops of good berries

and appear vigorous and healthy in every way. In the autumn these canes should be very carefully excavated, baring the roots without breaking them.

Only suckers found growing from the roots of the marked canes should be detached and used for planting in the nursery. These will all be true vegetative offspring of the selected plants.

There is no guarantee, of course, that all the selected plants were themselves clonally related, but that need not concern the grower who is raising suckers for his own planting.



A Lloyd George raspberry plant, carefully excavated to show how root suckers grow from roots of the parent plant. The two suckers on the right can be recognised as true clonal offspring of the original plant on the left, as they are attached to its roots. The plant on the left is beginning to show the "stooling" habit, new shoots (stool suckers) arising from the root of a previous year's sucker.

RASPBERRIES FROM SEED

There seems little doubt that in New Zealand the traditional way of growing raspberries from suckers is the one most likely to produce profitable crops if some measures are taken to ensure that the planting stocks consist of proven, heavily-yielding clonal material. Overseas, however, and especially in Britain, much has been heard recently about growing raspberries from seed—something of a novelty in commercial practice, though years ago raspberries were often raised from seed, which used to be listed in Continental seed catalogues.

Though raspberry propagation from seed has many grave drawbacks, it has the one great advantage that seedlings are free from virus disease, at any rate for the first few years, and it is for that reason that British growers are so interested in the proposal, which has been suggested as one way of overcoming their major virus problem. The raspberry virus problem in New Zealand seems quite different, and it is not necessary to use seedling raspberries as a measure for overcoming it.

Growers who have been thinking of raising seedling raspberries are warned that though seeds will grow readily enough they will produce a very mixed type of cane. For instance, about a quarter of the plants produced from Lloyd George seeds will bear yellow fruits, and about a quarter of the seedlings from Superlative will not produce any fruits at all, but only male flowers, which, of course, are completely unproductive. Though a study of the colour of the spines and the shape of leaves may make it possible to pick out from the seedlings most of those which would bear yellow fruits or only male flowers, it is doubtful if New Zealand growers need to turn to seedling raspberries as a solution to present troubles.

No New Zealand-bred Varieties

There is, however, scope for raising new varieties of raspberries from seed. It is a curious fact that, though the raspberry is so sensitive to local conditions, most of the varieties in cultivation in New Zealand were raised overseas. No varieties specially suitable for growing in the Dominion have been produced here by breeding, though it is probable that varieties could be bred which would bear much heavier and more regular crops in New Zealand than the imported varieties.

Anyone who is interested in breeding new varieties of raspberries should first study the work of M. B. Crane, F.R.S., of the John Innes Horticultural Institution, as this will enable much time and effort to be saved. The information in this article on the characteristics of seedling raspberries is based on some of Crane's work.

MANAGEMENT OF HIGH COUNTRY IN CENTRAL OTAGO

ABOUT a third of the occupied land in New Zealand is high country, the use of which is a very specialised and economically important branch of farming, involving distinctive systems of flock breeding and management and presenting to-day, because of early haphazard burning of tussock land, overgrazing, and rabbit infestation, serious problems of maintenance of plant cover and arable land for growing winter feed. These aspects of high-country farming and some of the economics of runholding are dealt with in this article by E. M. Bates, Instructor in Agriculture, Alexandra.

THE total occupied land in New Zealand is about 43,000,000 acres. The larger holdings, mostly on the high country, total about 12,500,000 acres, made up as follows:—

Size of holdings acres	No. of holdings	Total acreages
10,000 to 20,000	294	4,000,000
20,000 to 50,000	145	4,500,000
Over 50,000	55	4,000,000
		12,500,000

Most of the high country is Crown leasehold held by tenant farmers under small grazing runs lease or pastoral licence. Much of such land is in Central Otago, which for the most part is mountainous, particularly to the west of the Dunstan Range, with high run country ranging to 8000ft. above sea level. To the east the ranges are lower, less precipitous, and more widely spaced, forming typical semi-high country ranging from 3000 to 4000ft. Extensive valleys, river terraces, and plains up to an altitude of 1500ft. lie between the mountains, which occupy about 75 per cent. of the land surface. The pastoral and small grazing runs individually vary in altitude from 1000ft. to over 7000ft. Almost without exception today's runs are subdivisions of what were once Otago's big sheep stations, such as Puketoi, Hawkdun, Morven Hills, Moutere, Mt. Pisa, Kawarau, and Ayrburn.

Rents

Rents charged are about 5 per cent. of the unimproved value of the runs. For instance, a property of say £6000 unimproved value would have an annual rental of about £300 with adjustments according to local conditions



[J. D. S. Roberts photo.]
Sheep in winter snow near Bannockburn, Cromwell, Central Otago. Snow is a recurring hazard in Central Otago and is frequently the cause of heavy sheep losses in the high country.

such as accessibility and similar factors.

An applicant for a run is required to pay cash for improvements such as buildings, fencing, plantations, and pasture improvements (paddocks sown down). In certain approved cases country that has been surface sown may also carry an added value.

The occupier whose income is derived almost entirely from the annual wool clip must budget for a surplus of income over expenditure which allows a reasonable living and interest on capital invested in stock and improvements. It is important that a run should not become overcapitalised. Expenditure on essential buildings, fencing, and equipment must only be such as to allow for reasonable amenities and the economic working of the property to secure good returns. If unnecessary capital is tied up and a change of ownership is desired, difficulty may be found in procuring a purchaser.

The overhead necessary is no doubt one of the principal reasons for having large runs in these low-production, high-country areas.

Maintenance of Plant Cover

The vegetative cover in run country consists chiefly of various species of native tussocks such as snowgrass, silver, blue, and hard tussocks, and blue wheat grass varieties. Among the tussocks are lesser grasses and herbs which provide much of the grazing.

Even under the best of conditions carrying capacity is low. On average high-country runs where carrying capacity is about 5 or 6 acres to a sheep little can be done to build up the fertility through the stock, and a system of management that aims at maintaining the existing plant coverage by control of rabbits and by regulation of burning and stocking has generally been found to be all that is economically practicable.

Since the tussock land was first used for pastoral purposes many

HIGH COUNTRY IN CENTRAL OTAGO . . .

changes in pasture associations have been brought about by altered conditions of climate and burning and by stocking with sheep or rabbits. These associations have now reached a more or less stabilised state for the particular set of conditions ruling, though, due to various causes, depletion is continuing on many runs where the plant cover should have become fairly stable.

It is recognised that, above all, run country should never be overstocked, but this cardinal rule is too frequently violated because of force of circumstances. It is beneficial to spell deteriorated blocks completely, but the impracticability of fencing a great deal of high country makes this impossible.

Any improvement in either the density or quality of plant cover is a slow process. It might be attempted only in the lower altitudes, or over comparatively small areas. The effects of low rainfall and the necessity for rabbit-proof enclosures have limited attempts at improvement by surface sowing on the lower run country. There is need for further research under good practical farm husbandry methods in trying to establish over wide areas suitable grasses and herbs to improve the plant cover or to establish cover where it is lacking.

The depleted areas in the Vincent County under a rainfall of only about 12 to 15in. are confined mainly to the lower levels, where bare ground, much scabweed, and some poor annual grasses and herbs are usual on sunny faces. Clovers—especially white clover—numerous grasses, and other plants usually associated with tussock are most abundant on high levels, where, in the presence of sufficient moisture, summer growth too is good, because of the natural fertility of the soft mica-schist soil.

Sheep Breeds

On really high country of the Lakes district Merinos are general, with Merinos and fine half-breds on typical high country. Foothills sheep are mainly half-breds to fine crossbreds, chiefly Romney and Corriedale crosses, but Romneys have become more popular than Corriedale crosses. Merinos climb and muster better than long-woolled sheep.

The Merinos or Romney-Merino crosses of the district grow wools of 56's to 64's counts, with quality ranging from good (suitable for New Zealand mills) to average (Continental). Fleece weights are about 6½ to 8lb.

Apart from dairy stock, few cattle are carried, except in lower parts of the Lakes district and a few cattle on heavier land.

The total annual sheep returns for New Zealand in 1936 were over 30,000,000. Of these Merinos numbered

1,021,653, half-breds 2,498,612, and Corriedales 1,324,360.

It can be assumed that all Merinos, a great number of the half-breds, and even some of the Corriedales are depastured on high country. Omitting Corriedales, the sheep on high country would number over 2,500,000, a significant proportion of the total sheep population.

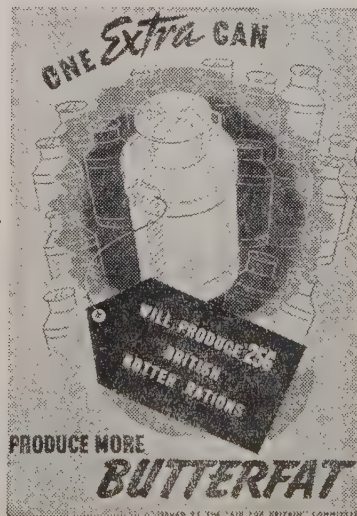
Merino stud sheep for that year totalled about 27,000, about 5 per cent. of all stud sheep registered. The total wool production for New Zealand in 1944-45 was 330,000,000lb., of which high-country wool comprises possibly 5 per cent.

Wool Types

Because of its fineness and spinning qualities high-country wool commands a high price and increases the value of export credit for wool out of proportion to its ratio to total production. Fine wools are now again in demand; however, if competition from synthetic wool is to be countered, quality must be kept up by maintaining and improving the standard of high-country flocks.

Aims in Breeding

The main interest of the farmer handling crossbred stock lies in the selling of fat lambs and fat stock. The fine wool producer must endeavour to breed an even type of sheep that suits the run country, to produce a good wool clip, and to maintain a balance of ages and sexes in the flock. His chief aim in breeding is to select good-quality, sound, uniform rams of a suitable type and fleece from flocks where conditions of climate, feeding, and management are not too divergent from those of the flocks in which they are to be used.



Flock hoggets should be culled for any deformity or defect in constitution. They should be selected more for fleece weight than other wool characters, and for wool of type and count most suited to the country. Selections should be based more on immediate returns, with dependence on a wise choice of sires for future development of the flock.

It must be borne in mind that the country will not sustain too great an increase either in wool or carcass. Actually it is practicable to grow only as good an animal as the country allows. Carcass and bone are limited by the amount and quality of the feed, and good-quality rams alone cannot compensate for lack of suitable and adequate feeding.

Management is largely responsible for development and nourishment of the fibre and growth of the fleece, but the country limits the eventual maximum weight and quality of the clips. A good weighty clip of well-grown, well-nourished wool can be grown on poor country only if stocking is so light as to be uneconomic.

During the period of lower prices for fine wools the inclination of many owners to grow a coarser wool and a heavier-built type of sheep led to injudicious grazing of hill country, as it was difficult to keep the coarser-woolled sheep, which showed no relish for the higher altitudes, from grazing the safer winter country too early in the season. When snow recurred stock losses were heavier. Once breeding is changed it takes many years to revert to the original and suitable types, and meanwhile constitution of the stock is likely to be affected and the weight of fleece reduced.

Balanced Flocks

A balanced flock is required to maintain replacements, and there must be difficulty ahead for the high-country man whose ewe flock is too small. On most runs the proportion aimed at should not be less than 1 ewe to 2 dry sheep, and the more favourably the balance can be tipped in favour of the ewes the better.

After a severe winter, with perhaps a poor lambing or a need for more stock, sheep may have to be bought in. This is usually done about February or March, and the stock then have a little time to settle down. Sheep shifted into high country are usually difficult to settle and will travel many miles toward their home country, and if sheep get into dangerous country, the death-rate is frequently high. If available and at a reasonable price, young sheep should be purchased, as they settle better.

The proportion of ewes that can be carried, the lambing percentages, and the mortality rate limit culling, as is clearly indicated by the very few cull

hill seconds in the saleyards. Culling is nearly all by the mouth and by general examination of the animal.

A Merino may not have a lamb until it becomes a six-tooth. Runholders cannot afford to sell their ewes until they have got all that the country will allow them to take from their stock. Aged Merinos, unlike half-breds, are not much use for fattening a lamb on more kindly country.

Limits of Carrying Capacity

The carrying capacity of any high-country run, particularly under the extreme climatic conditions of Central Otago high country, is governed by the number of sheep that can be wintered on it. A well-balanced run has summer and winter country providing approximately equivalent carrying capacities, but because of the many practical problems in subdividing the original large holdings into the existing runs, this desirable balance is the exception rather than the rule. The limited winter country available is a problem in high country.

Winter Feed

Small areas developed near homesteads by cultivation and possibly irrigation from creeks that do not dry up in summer are often used to produce winter feed, which may be hay or chaff with turnips and greenfeed. It is advisable to winter only as many sheep as there is adequate feed for, as turning stock out before spring growth begins reduces any benefit wintering may provide. An area of greenfeed will often tide over that difficult period between the last of the old growth and the first of the new. Some high-country graziers operate under the handicap of having to buy feed because there is no area on their properties suitable for the growing of crops for winter feed; others limit cultivation to an area sufficient to provide winter feed for backward hoggets. On all hill-country properties, if conditions allow, fully a third of the hoggets will benefit if they are wintered on supplementary feed.

Management of the Flock

Generally the less mountain flocks are disturbed the better. Mustering should be done only when necessary for efficient working, and should be carefully planned and carried out expeditiously, especially with ewes in lamb, so that flocks are returned to their pastures as quickly as possible.

Shortage of high-country musterers and blade shearers frequently increases difficulties of management.

The autumn muster serves to clear the summer country and get the ewes in for the ram. A good tupping block with 2½ to 3 per cent. of rams in good fettle is necessary for a good lambing. Too much hunting together of the ewes at this time is not good, but an oc-

HIGH COUNTRY IN CENTRAL OTAGO



The mountainous country of Central Otago is interspersed with glaciated valleys and river terraces.

casional mobbing up and holding together is necessary to see that the rams are well distributed. Six weeks is long enough to leave the rams out. On most run country it is a practice to crutch the ewes while they are with the rams. The sheep then go on to their winter or sunny country.

On high country snow risk is annual, but below the 3000ft. level it is periodic. Runs with too great an area of high country have greater snow risk, as it is necessary to make longer use of the higher, dangerous summer country. Usually sheep are removed from summer to winter blocks about the end of April or early in May. The careful high-country shepherd will have flocks placed to the best advantage, well spread and settled down in the winter blocks before normal snows occur.

Subdivisional fencing, if too intensive, may make a property more dangerous during unusually heavy falls of snow. A fenceline in the wrong direction may also result in heavy mortality. If the winter country is unfenced, or without good natural boundaries, the shepherds must keep a boundary until such time as the snow is low enough to keep flocks down to a safety line, somewhere below the 3000ft. level.

If an exceptional snowfall catches the sheep, the hardest and most worrying task of snow raking is necessary. Sheep must be moved out of deep snow on to clear, sunny faces, or places where they can be tracked and where there is a green bite to keep them going.

In most cases snow breaks round rocky outcrops and windswept ridges. More gentle slopes, especially the dark-lying ones, can prove veritable death-traps, as sheep endeavouring to find shelter from the fury of a snow-

storm take shelter there and too often are buried beneath a mantle of snow.

Though no time should be lost in freeing sheep snowed in, it is a mistake to rush them on to flats or to hay immediately snow has fallen if they are on good sunny faces which normally can be expected to clear in a few days to a week.

In the north-western portion of Otago, where most of the snowstorms are from the north and there is a tendency for snow to be swept on to the south faces, a foot of snow may be on the sunny side and nearly 2ft. on the cold side. Further east the reverse applies, and the snow most feared is that from the south which drifts on to the sunny sides.

As the country becomes clear of snow in the spring and growth comes away it is necessary to ease sheep out to prevent their "lying too heavy" on lower parts of the runs. On high country in Central Otago there is never much growth until November.

Usually some redistribution of the ewe flock is necessary before lambing, when the ewes come down to the flats and gullies in search of a green bite. If feed is available, it is good policy to take off the first wave of sheep coming on to the lower levels so that a fresh bite is left for later comers.

In direct contrast to a paddock ewe flock at lambing time, the high-country ewe flock should be as little visited as is compatible with making sure that all is well with them. If ewes are well settled on their country and in good heart when lambing approaches about October, they are best left alone. The Merino ewe is very "scary" and is over-inclined to leave her lamb if disturbed. The hilly nature of much of the country also deters

HIGH COUNTRY IN CENTRAL OTAGO



Even on the generally-depleted lower country with its rocky outcrops patches of tussock are common in moist situations.

the shepherd from going round at lambing time as is done on low country.

At marking time a few hundred ewes at a time should be drawn off from the flock to temporary yards, marked lambs being allowed to draw away with their mothers to the country on which they were lambed. On some properties lamb marking is carried out completely at one mustering, but because of the nature of much of the country this is not always possible, and only part may be mustered and the remainder marked at shearing time.

Hill-country ewes should average 66 per cent. lambing. Even with pure Merino ewes this result in a well-managed flock in reasonably good lambing country is not out of the ordinary. However, on really high country lambing is often nearer 50 per cent., as October is usually a cold month in the higher altitudes of the South Island and not without snow risks, and heavy losses may occur.

After shearing, mouthing, and branding about December and January ewes and lambs go to their summer country. Lambs should be weaned, wigged, and dipped about March and

put on to clean spelled country to winter. The unthrifty lambs should be removed for disposal, or, in the case of ewe lambs, put on to special feed. As it is difficult enough to keep up high-country flocks, it is essential that the young sheep be well looked after. The remainder of the flock is kept

hunted out on to the dark-lying, colder summer country of the runs.

Though Merinos are not included in the dipping regulations of the Stock Act, all sheep benefit from dipping, and much dingy and sandy wool could be avoided if careful dipping were undertaken about 6 to 8 weeks after shearing, when the wool is long enough to retain the dip.

Burning

Burning has been practised since high-country runs were first taken up. Haphazard over-burning of tussock lands by early settlers, the depredations of rabbits, and over-grazing brought about rapid early deterioration of tussock lands, especially in drier areas.

On many high-country runs some judicious burning appears necessary in strong tussock country where tussocks become too rank for feed and tend to smother out the finer grasses. Without deliberate burning accidental summer fires can result in a real scorching with extensive damage to the plant cover and heavy stock losses.

Burning is carried out in the spring when the roots of the plants are moist. Too early burning, especially of snow-grass, is not advisable, as it exposes the crowns to more severe conditions, and as sheep are still at the lower altitudes, heavy grazing gives an additional check. A little later stock will have spread with less concentration on the lower burnt tussock areas. As concentration of stock occurs in patch burning, burning in large blocks is preferable. Areas are burnt only periodically and burning may be limited to shady faces, especially on drier marginal country.

A certain amount of judicious burning is carried out in much of the high country of the Lakes County. The Central Otago portion of Vincent County is largely denuded. In parts of the district where rainfall is reason-



In the higher altitudes the primitive vegetation cover has been maintained fairly well.

able, burning, followed by over-grazing, is still being overdone, especially where heavy infestation of rabbits on marginal land occurs after burning. Burning without permission from the Land Board may involve a penalty of up to £100 or forfeiture of lease in extreme cases.

Snowgrass (*Danthonia flavescens*), which grows at high altitudes, is the tussock most easily destroyed by indiscriminate burning. It produces considerable feed after burning, and although the mature herbage is not relished by sheep, it affords useful feed during snowfalls.

Both silver tussock (*Poa caespitosa*) and hard tussock (*Festuca novae zealandiae*), which has a wider climatic range, are dominant on low tussock country. Both provide useful shelter for other plants, but are eaten by sheep only after a burn or when hard pressed for feed.

Blue tussock (*Poa Colensoi*) and *Poa intermedia* are the most useful and palatable of the native tussocks. They withstand burning fairly well, but are destroyed by indiscriminate burning or over-grazing.

Blue wheat grass (*Agropyron scabrum*) is one of the best of native grasses on unploughable tussock country, but is destroyed by continuous burning or over-grazing.

Tall oat grass (*Arrhenatherum elatius*) is able to stand up to very dry conditions, and the fact that its bitter taste is not relished by stock would not seriously offset its potential value if it were possible to establish the grass on the denuded land of Central Otago.

Rabbit Control

The rabbit is a pest of varying degree throughout Central Otago, ac-

cording to locality and control measures adopted. Although rabbits are bad in places and always a menace, their numbers have generally been greatly reduced over the last 25 years. With skins bringing high prices at present, war on the rabbit is severe, and rabbiters have been earning up to £10 a day. Elimination of the pest would bring solution of some run-country problems nearer, but the present system of destruction will certainly not lead to eradication. For some smaller runholders the rabbit is a source of income rather than a pest.

Unfortunately it is winter country that becomes rabbit infested, while high summer country presents no rabbit problem. The winter feed position is a deciding factor in the carrying capacity of any run, and if rabbits are troublesome, ability to control them is the basis of good management. If they are uncontrolled, winter country is always stocked—by sheep and rabbits in winter and by rabbits breeding there all summer.

Any method of killing rabbits is a good one, but methods are determined by type of country, degree of infestation, and financial ability of runholders. Only determined, constant attack will keep the pest within reasonable bounds. To destroy the last few rabbits, even with the aid of natural enemies, is practically impossible, and certainly far too expensive for runholders.

Income on high country at present is static, while labour and other costs have increased. Run country, too, is being affected by loss of arable land. Where costs are too high in relation to returns difficult country may be abandoned, which entails the cost of

policing abandoned areas to keep in check pests such as rabbits, deer, and weed growth. Economic units adjoining may easily become uneconomic if boundary fences have to be maintained by neighbours and heavy expense involved in mustering vacant country for stragglers. Should the price of wool slump, some runs now in a precarious financial position may need to be absorbed or left unoccupied. Such are economic problems affecting runholders during the past 25 years, during which inefficient management has been disproportionately bolstered up, often at the expense of depletion and impoverishment of the soil.

Weight Limit of Wool Bales

THE need for farmers to adhere as closely as possible to a limit of 400lb. in wool bales, when handling the new season's clip, is again stressed. There have been complaints recently about excessively-heavy bales coming into stores, and should 400lb. be exceeded frequently by an appreciable amount, it is likely that representations will be made to have weight restriction reimposed.

By a regulation which came into force on September 24, 1946 (The Wool Packing Control Order), the maximum weight of bales was fixed at 400lb. gross weight, but because of the shortage of jute and its effects on the manufacture of wool packs and other containers, the order was revoked on May 14, 1947.

It is pointed out that a "double dump" on the waterfront is still limited to 680lb., and bales over 400lb. have to be dumped singly.

Farmers should also remember that very tight packing of bales is detrimental to the display of wool.

During the period when the 400lb. maximum was enforced many overweight bales were received from farmers in the main centres of the North Island and involved stores in a tremendous amount of work in removing excess wool and re-pressing bales. More serious was the amount of floor space taken up at a time when storage requirements were fully taxed. Storage difficulties are still very great.

Care by the farmer is the best guarantee against any move to seek statutory limitation of the weight of bales and against the attendant storage problems.

Though the shortage of jute has produced a difficult situation, the supply of wool packs coming forward for the 1947-48 clip will be adequate to handle all wool without the necessity for putting excessive quantities into packs.



[E. A. Phillips photo.]

The rabbit is a pest of varying degree throughout Central Otago, but with skins bringing high prices destruction is severe.



Drop Everything
to make

Hay

Cut your grass when it's at its best . . . when it goes to seed it has lower feeding value. First-class hay and silage mean higher milk production. When the grass is right, sacrifice all farm activities to make hay.



**Better Winter Feeding Means More
of the BUTTER BRITAIN NEEDS**

H.1.24

ISSUED BY THE "AID FOR BRITAIN" COMMITTEE.

FARM WORK FOR DECEMBER

By the Fields Division.

CROPPING WORK

Swedes and turnips: During December many crops of swedes and turnips will be sown, particularly in the Southland and Otago districts. The aim in pre-sowing cultivation should be to obtain a fine, firm, and moist seed-bed. Consolidation is important, but in those districts where the crop is not going to be inter-cultivated there may be a caking of the soil and a greater weed problem if rain is experienced soon after sowing on a rolled surface. On those areas it is often a good plan to follow the final rolling with a light time harrowing just before drilling to destroy weed seedlings and to loosen the topsoil. In Otago and Southland, where the crop is sown on ridges, it may be advisable to use a roller over the ridges after sowing if dry conditions prevail.

Straight superphosphate should not be sown in contact with the seed; reverted superphosphate, serpentine superphosphate, or a mixture of 2 parts of superphosphate to 1 part of lime should be used. Brown heart disease may be controlled by applying commercial borax at the rate of 15 to 20 lb. per acre, using carbonate of lime as a spreader. (Burnt lime should never be mixed with the borax.)

Cereals: Sowings for autumn greenfeed of maize or Japanese millet may be made early in the month. Inter-cultivation or harrowing of established maize crops may be carried out. Little can be done at this time with the wheat, oats, or barley crops. Where greenfeed is to be sown after other crops the land should be ploughed as soon as it is free.

Potatoes: Inter-cultivation and moulding up of potato crops should be carried out during the growing season. The final moulding should be given as late as possible without damaging the crop. The best final mould is that which is brought to a point on a fairly broad base. If there is too narrow a base, the soil falls back into the bottoms of the rows, leaving the tops of some of the potatoes exposed.

Other cultivation work: Inter-cultivation of sugar beet, mangolds, pumpkins, carrots, and chou moellier may be carried out as required this month. Thinning of some of those crops may also be done now if the work has not already been done. Competition from weeds or having plants too closely spaced may cause a big decrease in yield.

Lucerne: Further cuts of lucerne will be taken this month from established stands. The right stage for cutting lucerne is when new shoots are coming from the bases of the plants. With new stands care should be taken to see that the seed-bed is thoroughly worked; sowing operations should be delayed until cultivation has been adequate to give a fine, firm seed-bed which has previously received surface working for the killing of weeds. Inoculated seed must not be sown in contact with straight superphosphate. A mixture of equal parts of superphosphate and carbonate of lime that has been mixed for some days is satisfactory.

HAYMAKING

Frequently the possibility of unfavourable weather at the most suitable stage of pasture growth for haymaking causes farmers to wait until they are more certain of good harvesting conditions before cutting their crop. This practice may result in the crop becoming far too mature and "stemmy" to produce anything but a maintenance ration. Should weather conditions continue unfavourable after the right time for cutting the hay crop, the farmer should consider whether it would be better to make silage instead of hay.

For the production of best-quality hay adequate drying in the swath is necessary, but not bleaching in the sun. Baling of damp hay results in a musty or mildewed product, and drying for too long causes a loss in food value. Though weather conditions may be the main factor in determining the value of the hay, care should be taken at all stages of haymaking to prevent unnecessary loss in quality.

Though cocking has become almost out-dated on most farms, for leafy lucerne and red clover crops it is the surest method of obtaining the best-quality hay. It is essential that the cocks be well made; they should be well hearted and raked so that they will turn most of the rain.

PASTURE MANAGEMENT

Sowing grass: Cultivation of areas to be sown in grass in the early autumn should have been started by December. One of the chief advantages of early sowing in the autumn is the production of a much greater quantity of good-quality greenfeed between late autumn and winter.

Those areas of grass which are being utilised for feed at this time of the year may run to seed in patches, particularly paspalum pastures. Weeds like Californian and Scotch thistles will also be running to seed. Although there is much other work at this time of the year, it will pay farmers to carry out "topping" with the mower on affected paddocks. If pastures are allowed to run to seed, their production generally will be greatly reduced during the remainder of the summer and autumn, when they may be urgently needed, specially if drought conditions prevail.

In the management of pastures the aim should be to give stock the benefit of feed from short, leafy growth rather than from "stemmy" growth. The short growth is of higher food value because it is more digestible, contains more protein, and contains more phosphate and lime, and is therefore of much greater value to milking cows, to ewes with lambs at foot, and to young stock. Controlled rotational grazing makes use of this more productive pasture, resulting in a higher carrying capacity than may be obtained under set stocking conditions.

GENERAL

Machinery: On grassland farms haystackers, hay-loaders, sweeps, hay-balers, and mowers should be thoroughly overhauled before they are required for use. Frequently accidents or delays occur merely through lack of care in replacing worn parts and ropes.

On arable farms harvesting machinery should be given a thorough overhaul this month. It should be remembered that when harvesting actually begins most machinery firms and blacksmiths will be too busy to attend to jobs immediately.

Water supply: The water supply for stock and dipping should be checked over to see that everything is in order before conditions become dry.

Stock: Shearing is carried out on most sheep farms during the month. Before going into the shed all dirty sheep should be "dagged," as this prevents trouble in the shearing shed. Weaning of lambs may take place later in the month, and weaned lambs should be put on to fresh pastures with ample water supply. From this time of the year onward trouble may be experienced from blowfly "strike." One measure of control is to ensure that all dead carcasses are either burnt or buried. In bad districts sheep should be mustered and inspected at frequent intervals for the start of "strike." All sheep should be kept clean. Calves on dairy farms may be weaned this month. They should receive the best of feed and may graze paddocks before the dairy cows.

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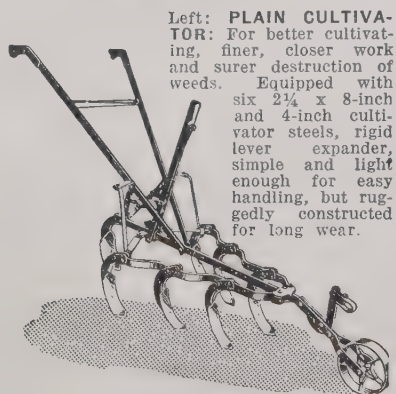
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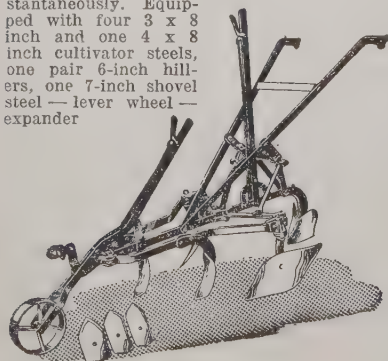
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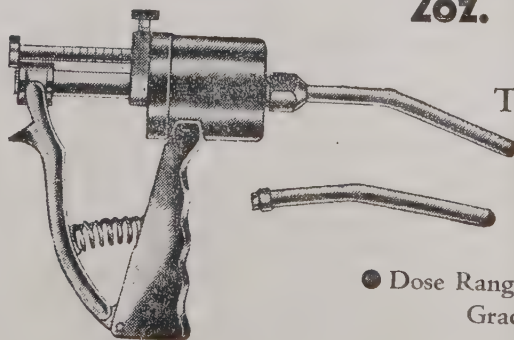


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THE HOME GARDEN IN DECEMBER

By A. G. KENNELLY, *Instructor in Vegetable Culture, Christchurch.*

THOUGH many home gardeners may have lost by December much of the flush of enthusiasm with which they commenced the new season, in the well-planned garden there is much important work to be done. This includes weeding, hoeing, and spraying, the planting out of late autumn and winter greens such as cabbage, cauliflower, broccoli, and leeks, and making successional sowings of French or dwarf beans and beetroot and in some districts of swedes, parsnips, peas, and carrots.

LIQUID manure can with advantage be applied to most crops and where necessary watering or irrigation should be attended to. The supply of water is particularly important in the growth of beans and celery and to only a slightly less extent in that of asparagus, rhubarb, and lettuce. Tall crops such as runner beans should be staked, and tomatoes will require pruning, tying, and staking. Salad crops should be sown to maintain succession.

Asparagus

On most beds future production may be impaired if harvesting is continued much beyond 7 or 8 weeks. This period usually terminates about the end of November or the middle of December according to the district. As soon as cutting is finished the beds should be cleared of weeds and cultivated. They usually benefit from the application of a good handful of blood and bone to each crown plus a dressing of wood ashes broadcast over the whole bed. Compost worked into the topsoil is excellent and will further assist the growth of the strong, healthy fern by which the roots are enabled to develop and store up food for next season's growth. Strong fern growth also assists in the suppression of weeds. During the summer and autumn the beds as far as practicable should be kept cultivated and free of weeds; if growth is strong enough, it should smother most weeds.

Beans

To keep broad bean plants sturdy it is a good plan to pinch out the tops when they are 3 to 3ft. 6in. high. The black aphid often attacks them at that stage, and if the soft shoot at the top is promptly pinched out, the aphid, which does not multiply as rapidly when forced to feed on the harder growth lower down, can usually be controlled by such natural enemies as ladybirds, lace-wing flies, and their larvae. Should the aphid continue to be troublesome it can be easily controlled by spraying with nicotine sulphate at the rate of 1 fluid ounce to 4 gallons of water plus 2oz. of soft soap to serve as an activator.

A successional sowing of dwarf beans made during the month will en-

sure continuity of supply. The pods of established crops should be picked before full maturity; if allowed to remain, they usually bring about an early decline in vigour in the plant. Beans do not require any particular type of soil, though a well-drained, friable loam reasonably supplied with organic matter is most satisfactory. They are not deep-rooting plants and do not do well in soils that dry out. The later sowings made in dry weather can be made a little deeper, as the ground is then warmer and deeper sowings are less likely to be adversely affected by the sudden changes in temperature and moisture which cause non-setting of the flowers and malformation of the pods.

Sow the seed 3in. apart and 2in. deep in drills 2 to 3in. deep and later thin the plants to stand 6in. apart in the rows. Beans are not gross feeders and if a fertiliser is thought to be necessary, superphosphate applied at the rate of 1lb. to 7 yards of row will be found satisfactory on most soils.

Celery

Though cultural conditions may be excellent, results from celery are likely to be poor if adequate steps are not taken to combat leaf spot. Treat-

ment usually commences with the seed. To kill the spores of the leaf spot the seed should be enclosed loosely in a bag and immersed in a large container full of water (a kerosene tin is suitable) at a temperature of 135 degrees F. for 10 minutes. Spraying with freshly-mixed Bordeaux (or one of the Government Certified copper substitutes) should commence in the seed-bed and continue at intervals of not more than 14 days until the plants are boarded up for blanching.

If aphid is present, nicotine sulphate at the rate of 1 fluid ounce to 4 gallons of water can be combined with the fungicide. Carrot rust fly also attacks celery, though it rarely causes serious damage. Where it is present the plants can be protected by broadcasting horticultural naphthalene at the rate of 4oz. to 20ft. of row. It acts only as a repellent and as it is volatile, it should be applied fortnightly until about 14 days before harvesting, when its use should be discontinued to avoid the risk of spoiling the flavour of the celery.

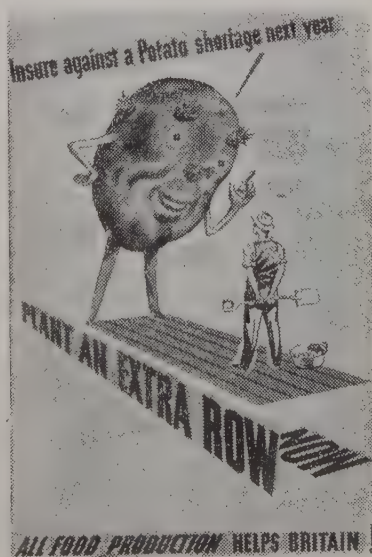
In specially-sheltered areas or in districts which experience a sufficiently-long autumn and mild winter the seed for a late crop of celery can be sown early in December. The seed should preferably be sown $\frac{1}{2}$ in. deep in boxes of prepared soil in a warm, sheltered situation. It should not be allowed to get dry and the seedlings should be pricked out about $2\frac{1}{2}$ in. each way into boxes of prepared soil of good humus content.

Herbs

Though the drying and storing of herbs for winter use is not as commonly practised as it used to be, it is well worth while in gardens where supplies in winter are otherwise difficult to secure.

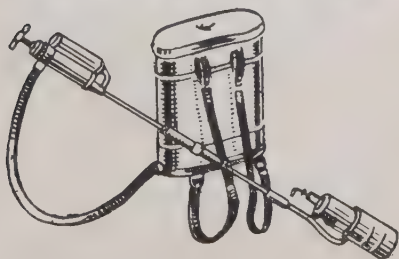
Mint

In most districts mint is best cut almost to the ground in February, but if there is "rust" on the leaves, it is better cut in late December, and then if growth is good, a second cutting may be made in March. It should preferably be cut after a shower, before the sun has dried the rain off. The secret of preserving the colour is to dry quickly at a temperature of 90 degrees F. It should not be heaped, but it can be tied together in small bunches and placed on a wire cake-stand or spread out thinly in a flat paper box lined with brown paper. The desired temperature can best be maintained by drying in an oven with the door ajar. The leaves should be stripped from the stalks, and after being rubbed or crushed until fine, they should be stored in a screw-top jar.



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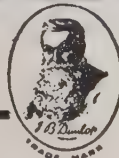
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After cutting, the mint bed should be weeded and pricked over lightly with a fork and topdressed with an inch or two of good soil to which some compost or a little organic manure has been added.

Parsley

The most desirable dried parsley is obtained by constantly picking a few of the best young leaves as they develop in the summer and autumn. Spring-dried parsley rarely keeps its colour. Parsley is best dried in a very hot oven where the heat is maintained right to the end of the drying, conditions of which are otherwise similar to those for mint. It should be rubbed down without delay as soon as it is dry and crisp, for if allowed to reabsorb moisture, it soon becomes rubbery in texture. Though parsley is sometimes gritty with soil from rain splashes, it should not be washed with boiling water before drying, as is often done. The difficulty of cleaning it can usually be overcome if it is thoroughly shaken in a sieve or wire frame. Parsley should be sown twice a year, in the autumn and spring.

Sage

Sage can be cut twice in the season, once in December and again in February or early March. In most districts it can be dried by prolonged exposure to the sun, but it should be taken inside at night and in damp weather, or, alternatively, it can be oven-dried. Subsequent treatment is the same as that for mint. Sage plants should be cultivated and dressed lightly with organic material such as compost or farmyard manure after cutting.

Thyme

It is usual to cut thyme twice in the season, once before the flowers open at the end of November or beginning of December and again in February. It is easier dried than the other herbs, but crushing is more difficult and is best accomplished by rubbing through sieves of progressively-smaller mesh. The plants should be kept cultivated and will benefit from a light dressing of compost or similar material in early spring.

Leeks

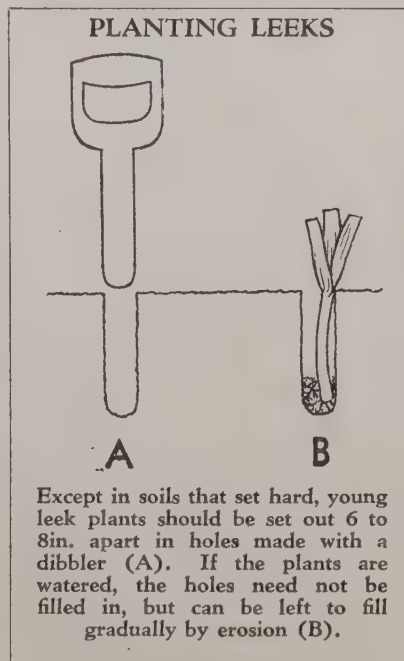
The leek is one of the most useful vegetables. It can be grown to be available from autumn until early summer if plantings are spread over the December-January period. The early plantings will be available during late autumn and early winter, and the late ones, which should be reasonably mature when growth slows or ceases at the onset of winter, will "stand" quite well in most districts until late spring or early summer. Though leek seed in New Zealand does not always appear to be true to name, and there is consequently some con-

fusion of varieties, the leeks in this country are all derived from three main types of British origin, which are as follows:—

1. **The London or Broad Flag.** This is an early variety characterised by its long stem and soft, broad, fresh green leaves. It seems to be quite hardy everywhere in New Zealand, but is a more tender type than the others.

2. **The Musselburgh or Scotch Leek.** The leaves of this variety are large, but are narrower than those of the London Flag, and the stem is longer and thicker.

3. **The Lyon.** This is somewhat like the London Flag, but is larger and slower in maturing and consequently is excellent for late use.



Except in soils that set hard, young leek plants should be set out 6 to 8in. apart in holes made with a dibbler (A). If the plants are watered, the holes need not be filled in, but can be left to fill gradually by erosion (B).

Though leeks will stand more ill treatment than almost any other vegetable, they respond well to good cultivation and manuring. Good crops can be grown on almost any kind of garden soil, though a light sandy soil which dries out quickly or is deficient in humus is not suitable. A clay loam rich in organic matter is probably the best. The leeks should not at any time be allowed to become dry at the roots, as this will quickly force them into seed development. Blood and bone well worked into the soil at the rate of 1lb. to 20ft. of row is one of the best manures to use.

Plants are only rarely sown in the rows where they are to mature. The usual practice is to sow them either in boxes or in rows in a seed-bed. When the young plants are about 8in. tall they are watered and carefully lifted. The green tops are reduced by be-

tween two-thirds and one-half and the plants set in holes 6 to 8in. apart so that only the green tops are protruding. The rows should be 12 to 15in. apart and, except in very heavy soil, it is preferable to make the holes in a trench drawn out 3 to 4in. deep with a hoe. In soil that is inclined to set hard it is advisable to make the holes with a trowel rather than a dibbler. If the plants are watered immediately, there should be no need to fill the holes after dropping the plants in, for the water will wash down sufficient soil to give them a start and the remainder of each hole will gradually fill under the influence of the weather.

Parsnips

If parsnip seed has not yet been sown, a sowing should be made without delay. Seed germination is rarely good, and though parsnips are not as a rule used until after the first frost, they require a considerable time to develop. Sow $\frac{1}{4}$ to $\frac{1}{2}$ in. deep in rows 12 to 15in. apart and thin later to 4 to 6in. apart in the rows. Soil which was heavily manured for a previous crop is excellent. It should be deeply dug and well drained and should not contain freshly-applied, bulky organic manure, as this is liable to cause forking of the roots. Hollow Crown is the variety recommended.

Potatoes

December is rather late for planting potatoes and the measure of success achieved will depend mainly on the district or the dryness of the season. It is usually advisable to choose an early or a second early variety. Aucklander Short Top is suitable; it is commonly used as a second early, though it is actually an early main crop. Potatoes require a well-drained soil rich in humus, and if fertiliser is required, it can be supplied by dusting a mixture of 3 parts of superphosphate and 1 part of sulphate of ammonia in the trench at the rate of 6 to 12oz. to every 6 yards of row before planting. Cut or whole tubers can be planted 10 to 16in. apart in a trench 4 to 5in. deep taken out with a hoe. For early and very late planting the closer distance is as a rule preferable.

The moulding or earthing up of the main crop and the digging of the early crop will now be proceeding. The ridges should be finished off to as sharp a point as possible. This prevents spores of potato blight from being washed down by rain to infect the tubers. It is not advisable to try to earth up when the soil is wet. Blight attack depends largely on the weather; frequent spells of moist, warm weather are conducive to attack, and where the area of potatoes is sufficient to warrant it, preventive spraying with Bordeaux or suitable copper substitute is recommended.

THE HOME GARDEN IN DECEMBER . . .

Potato Moth

In parts of the country where the climate favours it the potato moth is a most destructive pest in the potato crop. It causes two distinct forms of injury: First, to the tops of the growing plant early in the season, when the young plants may be destroyed by the grubs feeding on the leaves and tunnelling in the stems, secondly, to the tubers if they are exposed while growing or if allowed to remain in the field for any length of time after digging. Serious infestation of the tubers may also occur after they have been stored. The moth is small and light brownish-grey, the body of the female being about $\frac{1}{4}$ in. long. It lays 20 to 30 eggs and the point of infestation is usually the eyes.

Control Measures

Measures to control the potato moth are:—

1. Planting of clean seed.
2. Spraying with an arsenical spray to kill the young grubs on the foliage early in the season.
3. Adequate moulding so that tubers do not become exposed.
4. Storage in clean (uninfested) bags.
5. Bagging as soon as possible after digging and closing the bags securely and storing them at once.
6. Collecting and burning all potato tops after digging.
7. Destroying weeds such as night-

shade, thorn apple, and henbane, which also serve as hosts for the moth. (The moth is also known to attack tobacco and tomatoes and should if necessary be controlled on them by spraying.)

Rhubarb

Treatment of the main varieties of rhubarb is very similar to that recommended for asparagus. Harvesting of the main crop should not last beyond about 8 weeks, though, of course, this depends on the vigour of the plants and amount of harvesting done. The plants should then be given a dressing of farmyard manure, stack bottom, or compost. Where bulky organic manures are lacking a couple of handfuls of blood and bone can be worked shallowly into the soil about the crowns.

The early dying down of the leaves and ripening of the crowns are very important factors in successful rhubarb culture, and it is not advisable to apply stimulating fertilisers after the application following the last pulling. It is a good plan where space permits to have several plants of each of three varieties. An early variety such as Early Albert, which can be forced by covering it in early spring with straw or a good-sized box, can be followed as soon as the early plants require resting by a main crop variety such as Champion Seedless, which should in turn provide supplies until small fruit are generally available. Finally, the planting of an ever-bearing variety

such as Perpetual will provide supplies in late autumn and winter.

Swedes

Though it is usual in southern districts to sow earlier, swedes can now be sown in most northern districts if conditions are not too dry. The swede is a cool-weather vegetable and moist conditions are essential to good crops. Grown in hot or dry weather, the roots are inclined to become woody and tough and the plant readily runs to seed. Seed should be sown thinly $\frac{1}{2}$ in. deep in rows 12 in. apart, and the young plants later thinned to 6 to 8 in. apart in the rows. Quarter of an ounce of seed will sow 100 ft. of row. Soils which contain plenty of well-rotted organic matter such as those which were heavily manured for a previous crop are best. Superphosphate at the rate of 1 to 2 oz. per square yard is generally an advantage.

It should not be forgotten that the swede is a crucifer and subject to attack by club root disease. The soil should not therefore be allowed to become acid, for if the spores of club root are then introduced into it, they will spread quickly. An annual dressing of lime at the rate of 2 to 3 oz. per square yard will as a rule ensure that the soil remains sufficiently alkaline to inhibit the development of club root.

Tomatoes

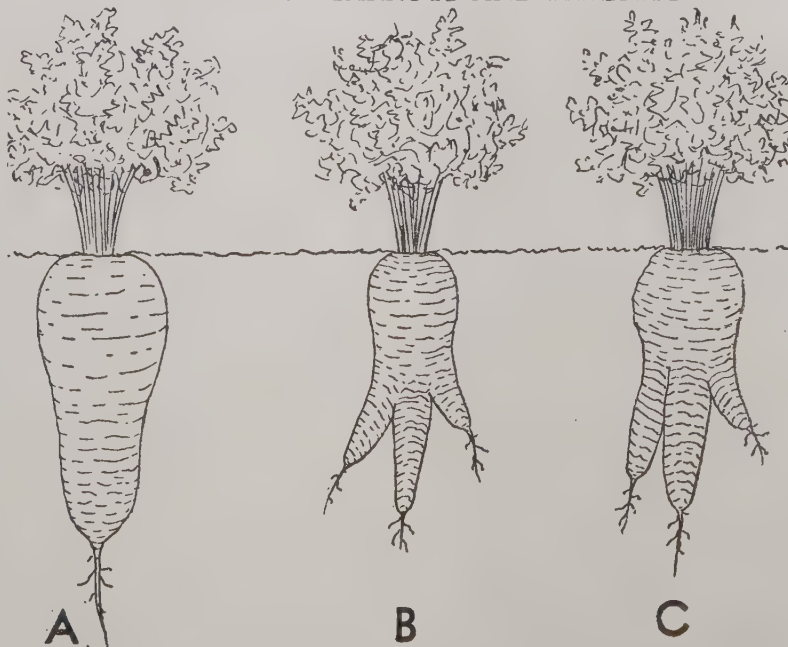
Early December is not too late to plant out tomatoes. The ground has by then warmed sufficiently to enable the young plants to start into vigorous growth immediately instead of standing still, as is so often the case with early plantings. Fertiliser can be applied by taking out a shallow furrow along the proposed row and sprinkling evenly along it 4 oz. of blood and bone or 5 oz. of finely-ground bonedust to each 9 ft. of row. On virgin soil or soil that is reasonably rich in humus the application of $\frac{1}{2}$ pint of liquid manure (made by dissolving 8 oz. of superphosphate and 4 oz. of sulphate of ammonia in 4 gallons of water) to each hole before planting has proved of great value in giving the plants a start. The manure should not be allowed to touch the foliage.

Few plants are more subject to disease than the tomato. Of the many diseases that have been recorded the following are among the most important.

Virus Disease

The virus disease spotted wilt ("brown top"), which was described in last month's "Journal," probably causes the greatest loss outdoors, but the many other types of virus, either alone or in combination, are also responsible for considerable reduction in yield. Virus diseases of importance are streak, which causes dark-brown, longitudinal stripes on the stems, bushy stunt, distorting or enation dis-

GROWING OF CARROTS AND PARSNIPS



Carrots and parsnips fork if they come in contact with bulky fresh manure such as stable manure (B and C) and so cause waste in preparation for the table. A shows the desirable type of carrot.

ease, mosaic, yellow mosaic, (the names of all of which are descriptive of the symptoms of the diseases), and cucumber mosaic, in which the leaves become abnormally sharpened and finally fern-like in appearance or reduced to mere threads.

Most of the virus diseases are transmissible by rubbing and so are readily transferred from affected to healthy plants when pruning or tying. It is therefore advisable to wash the hands or pruning knives in a good disinfectant after handling affected plants.

Virus disease cannot be cured, but plants affected by mild forms of some of the viruses can be induced to produce fair crops by good cultural practices and a suitable manurial programme. Insects such as thrips and aphids which in certain instances act as vectors in transmitting the disease should be kept down by regular spraying or dusting. Control consists mainly of roguing affected plants and of general hygiene and, for the future, the breeding of resistant varieties.

Fungous Disease

The leaf mould disease (*Cladosporium fulvum*) most commonly occurs under glass. It is easily recognisable by the pale greyish mould consisting of very fine fungal threads on the undersides of the leaves. Ventilation is of the greatest importance, and as long as it does not affect the setting of the flowers the humidity of the air should be reduced as far as possible. Spraying with a suitable fungicide is of value in keeping the disease in check, but it must be commenced before the disease is established.

Late Blight

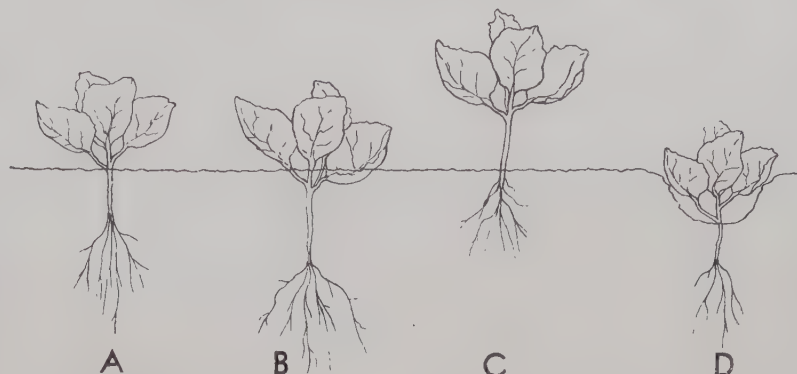
Late blight is also known as Irish blight or potato blight. It is sometimes troublesome in wet seasons, but can be controlled by spraying with Bordeaux or fungicides similar in action. Spraying is most effective when carried out as a preventive measure before the disease appears.

Wilt

Verticillium wilt and fusarium wilt are, as the names imply, mainly manifest by the wilting that takes place. Growers of outdoor tomatoes can do very little to combat them. Sometimes earthing the plants up at the base and encouraging them to produce adventitious roots and practising a suitable manurial programme will help, but where only a few plants are affected they are usually best carefully removed and burnt and the holes watered with a solution of copper sulphate (bluestone) at the rate of 1oz. to 2 gallons of water. Though they are fungous diseases, they are not amenable to spray treatment, as they affect the sap-conducting vessels. They may be distinguished by a brown staining. In fusarium it is to be seen near the root or "collar" and in verticillium it

THE HOME GARDEN IN DECEMBER

CORRECT PLANTING OF BRASSICAS



Brassicas should be planted so that the soil reaches just as far as the first pair of leaves (A), and the roots should be well spread. B is planted too deep and C too far out of the ground. In dry soils the plants can be set out in a shallow trench (D).

can often be seen right up to the apex of the plant when the stem is cut open.

Early Blight and Septoria Spot

Early blight and septoria spot are common fungous diseases and are controlled similarly to late blight. They can usually be recognised by the irregularly-shaped spots which develop on the leaves.

Bacterial Canker

Bacterial canker is a bacterial disease, and can usually be recognised by the dark-brown, sunken cracks or cankers on the stem. The lower leaves turn downward and wilt, and the leaflets become brown and curled. There is no cure. Affected plants should be rogued and burnt immediately the disease is positively identified.

Late Autumn and Winter Vegetables

Plants of Savoy cabbage, curly kale, Brussels sprouts, broccoli, and leeks should now be ready for setting out in deeply-dug, well-drained soil that contains plenty of organic manure. A judiciously-chosen list of varieties of these vegetables will ensure both continuity and variety of supply until the new season's crops are available. With the exception of Brussels sprouts and kale, some varieties of which should be given a little more room, most brassicas should be set out about 18 to 24in. apart in the rows with the rows 2 to 2ft. 6in. apart. The actual distance within these limits is determined by the ultimate size of the variety.

When planting out green crops in hot, dry weather it is a good plan to puddle the roots in thick muddy water as soon as lifted and to cut off about one-third of the outer leaves. This ensures that the roots remain moist

during any delay in planting and consequently the plant will be less likely to wilt and later lose leaves.

PEST AND DISEASE CONTROL

With the advent of warmer weather the home gardener has again to face the prospect of combating the many insect pests and diseases which assail his crops. It is a mistake to think that insect and disease attack is always the result of poor cultural practice. Certainly in some cases well-nourished plants in healthy condition tend to ward off certain diseases, but more often the large, tender, succulent plants produced by sound cultural practices or "good husbandry" make ideal hosts for a parasitic disease or insect pest.

To combat garden pests and diseases effectively the home gardener must not only be able to recognise or identify them, but should know something of their method of attack or life history; he should also have an understanding of the more common treatments so that he can apply the appropriate one at the correct dosage and at the right time. The first obvious step in combating a garden foe that is damaging a crop is its recognition as either an insect pest or a disease. If it is an insect pest, the gardener should ascertain its method of attack, and if it is a disease whether it is virus, fungous, bacterial, or physiological.

Insects

If the home gardener has decided that the damage is being caused by an insect, he should know that for control purposes injurious garden insects can be classified as either chewing insects or sucking insects.

Chewing insects have mouths adapted to chew or eat plant parts.

THE HOME GARDEN IN DECEMBER . . .

They can be controlled by a stomach poison such as arsenate of lead applied to plant surfaces, or in a few cases mixed in a bait. Examples of this kind of insect are caterpillars, grubs, weevils, slugs, and snails.

Sucking insects either feed by piercing the plant surface with a stylet, or "beak," and sucking the plant juices underneath (for example, aphids and plant bugs) or by rasping the surface tissue and sucking the exuding sap (thrips and red spider). Insects with such specialised mouth parts cannot be killed with a poison bait and, with the possible exception of the thrips, they cannot eat poison sprayed on the foliage. They must be drenched or dusted with a contact insecticide like nicotine or oil, preparations containing rotenone (a dual-purpose insecticide), or perhaps one of the newer insecticides having as their active agent D.D.T. or gamma-isomer. They may be used either as sprays or dusts. (A number of trials of these preparations have been carried out by the Horticulture Division to determine their relative efficacy for the control of white butterfly and diamond-backed moth. Results were good, but further trials are being conducted to investigate minor points regarding application.)

In enclosed spaces both types of insect can be killed by the use of a suitable fumigant such as hydrocyanic acid, carbon bisulphide, or nicotine sulphate. Hydrocyanic acid and carbon bisulphide produce very dangerous gases and are rarely required by home gardeners.

Diseases

There is a great similarity in diseases of plants and animals. Apart from diseases caused by deficiency or physiological conditions, the diseases of both are caused by direct infection. They spread by contact, by means of small microscopic "seeds" called spores, and by bacteria and start growing when given suitable environment.

The following is an outline of the principal divisions of plant diseases:—

1. **Virus diseases** like spotted wilt of tomato, mosaic, and streak cannot be cured. If the attack is a crippling one, affected plants should be rogued to prevent further spread. Spraying to keep down the insect vectors of the disease, hygiene (washing hands, tools, etc.) after working with an infected plant, destroying susceptible weeds, and the use of clean seed and resistant varieties are the chief means of control.

2. **Bacterial diseases** include bacterial blight of beans, bacterial canker, and bacterial spot of tomato and other plants. Control consists of spraying or cutting out the affected parts, use of clean seed, burning of rubbish, and general hygiene. Though not recog-

nised as a general practice, spraying with a suitable fungicide has been found to give excellent results in certain cases.

3. **Fungous diseases** are late blight (Irish blight) of tomato and potato and various mildews, rusts, and moulds. In most cases control is relatively easy if the appropriate spray is used at the right dosage and time. Fungicidal sprays such as lime sulphur, colloidal sulphur, and dusting sulphur and Bordeaux and other copper sprays sold under trade names are commonly used.

4. **Physiological diseases** are chlorosis (lack of green chlorophyll in the leaves), and gumming, stunting, reddening, yellowing, and purpling of the foliage. They are usually cured by correcting the environmental conditions which cause the trouble, for example, excess or lack of water or

manure, lack of shelter or soil compactness, too low temperatures, and frost.

5. **Deficiency diseases** are caused by the lack of some essential plant food or element in the soil, for example, boron deficiency in celery, swedes, and cauliflowers, which causes a browning or breakdown of the tissues, and potash deficiency of tomatoes, which affects the colouring of the fruit. There are many other deficiencies which may cause the leaves to become highly coloured or the plant stunted or worthless from the point of view of production. Most deficiency diseases require expert knowledge for their diagnosis. They are often confused with diseases of physiological origin, but home gardeners who build up the humus content of their soils and who follow good cultural practices are unlikely to be troubled by either physiological or deficiency diseases.

CONSIGNMENT NOTES FOR REMOVAL OF SHEEP

THAT the provisions of the Stock Amendment Act, 1938, which require the completion of consignment notes in certain cases on the removal of sheep are frequently not being complied with is evident from information reaching the Department of Agriculture. The consignment note procedure was introduced as a deterrent to sheep stealing and in their own interests farmers and carriers should comply with the requirements of the Act when sheep are being removed.

Under the Act no person shall convey sheep unless he is the holder of a consignment note as prescribed under the Stock (Conveyance of Sheep) Regulations, 1938. This consignment note shows particulars of the sheep, the places to and from which, the route by which, and the manner in which they are to be conveyed and other related particulars. (Note: For the purpose of the Act "sheep" means any ram, ewe, wether, or lamb.)

The consignment note is required to be prepared in triplicate, and before sheep are removed all three copies are to be signed by the owner of the sheep or his authorised agent and by the person removing the sheep. One copy of the consignment note is retained by the consignor (usually the owner of the sheep), one copy by the carrier, and the third copy is to be delivered to and retained by the consignee or other person taking delivery of the sheep. On delivery of the sheep at their destination the copy of the consignment note held by the carrier is required to be signed by the consignee or other person taking delivery.

Where sheep are taken to rail the consignment note is prepared in duplicate and again both copies are required to be signed by the owner or his agent and the carrier before removal of the sheep. One copy is re-

tained by the owner and the other copy by the carrier. On delivery of the sheep at the railhead the carrier must attach to his copy of the consignment note a copy of the railways consignment note for the sheep, and these notes must be kept so attached for not less than six months after the removal of the sheep.

Every person required to sign a consignment note for the removal of sheep must produce it for inspection forthwith while he is removing the sheep or within 24 hours at any time within six months after the removal of the sheep. Persons authorised to inspect consignment notes are:—

(a) Any Justice or constable; (b) Inspectors of Stock; (c) inspectors appointed under the Meat Act, 1939; (d) inspectors appointed under the Motor Vehicles Act, 1924.

The provisions outlined above do not apply with respect to:—

(a) The conveyance of sheep by the owner or his servant within the limits of land in his occupation or from any such land to any other land occupied by him distant not more than 12 miles from such land.

(b) The conveyance of sheep within the limits of any borough.

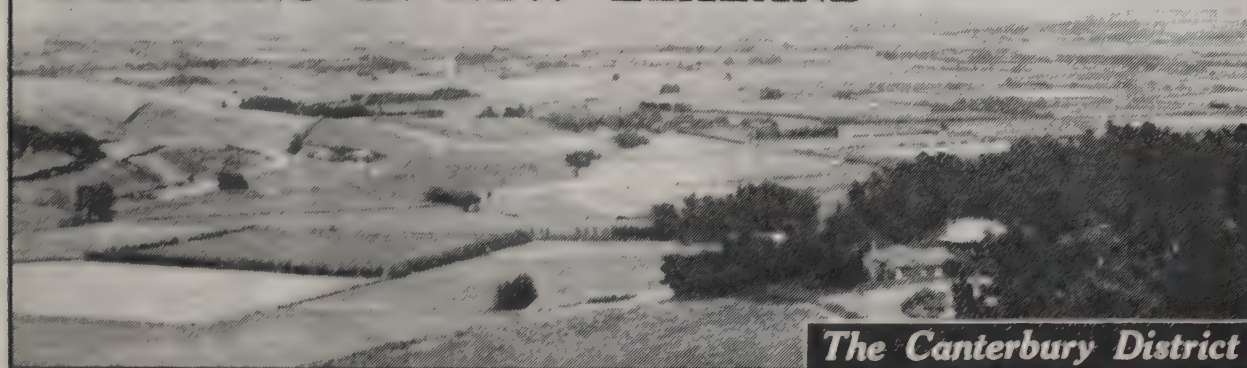
(c) The conveyance of sheep by the owner or his servant to or from any public saleyard provided it is not more than 12 miles from his homestead.

(d) The conveyance of sheep by the owner or his servant to or from any show or exhibition held by any Agricultural and Pastoral Society or by any other society or association.

(e) The conveyance of sheep in the course of his employment by any person employed by the Government Railways Department.

(f) The conveyance of sheep under a bill of lading or other shipping document.

FARMING IN NEW ZEALAND



The Canterbury District

IN the first part of this article, published in last month's issue of the "Journal," R. P. Connell, Fields Superintendent, Christchurch, dealt with various factors affecting farming in Canterbury and the main types of farming carried out in the province. In this concluding part he discusses types of pastures and trends in production.

IN addition to the tussock grassland the main types of pastures in Canterbury are:—

Long-rotation pastures in which perennial ryegrass is prominent: The best of these pastures are of high quality and productivity and occupy some of the most fertile land in the province. These lands, principally the drained swamps, carry swards in which the main ingredients, ryegrass and white clover, are usually mixed with Yorkshire fog and are largely used for dairying. These pastures stretch from Rangiora, through Kaiapoi, Styx, Halswell, and Tai Tapu toward Leeston. They are found in parts of the drained coastal strips in Ashburton and South Canterbury and in the bays of Banks Peninsula near sea level.

Other good long-rotation pastures in which ryegrass is prominent are to be found in the good mixed-farming land. There white clover, red clover, and a small quantity of cocksfoot may be mixed with the perennial ryegrass. On such land arable cropping has a larger role and often the pastures are allowed to persist for only about 4 years, but the tendency is for their life to lengthen.

Cocksfoot pastures: The cocksfoot pastures are not extensive. They are chiefly found on Banks Peninsula, where they have developed from the surface sowing of the cocksfoot, and on the drained swampland of the Ashburton coastal belt, where considerable areas of cocksfoot sward are utilised for seed production. The persistence of cocksfoot as a dominant constituent of the sward is determined partly at least by the nature or extent of the grazing. This has been demonstrated

on Banks Peninsula, where at times cocksfoot has given place to danthonia as the dominant constituent. Probably in certain instances a falling off in fertility has been a factor in this change.

Browntop pastures: Browntop (*Agrostis*) is the dominant species in a considerable part of the grassland of Canterbury, principally in the foothill country, where there are areas which have persistently run to pure stands of browntop. The soil of these areas is often of good depth and satisfactory quality, but in places the natural drainage is poor and in others the soil is relatively poor and perhaps gravelly. Generally the rainfall is favourable to grassland, as at times it is 35 in. or more a year. On the west the browntop areas adjoin tussock grassland, into which the browntop is spreading, and on the east the aggressiveness of the browntop falls off with decreasing rainfall, which facilitates cultivation to control the browntop. Originally the browntop areas were occupied by tussock grassland in which the silver tussock was prominent.

Short-rotation pastures: These have developed in country which originally was tussock grassland, usually where the soil was thin and somewhat low in fertility, low rainfall at times being a factor contributing to the low fertility. Short-rotation pastures occur extensively on the lighter arable lands of the province. The returns from them have often become poor only a few years after establishment, and when this has happened some have been ploughed up and the land sown in turnips, followed by rape or oats, and then sown in ryegrass and clovers. Other pastures have been allowed to continue longer, usually at an unsatisfactorily low level of production.

Improvement of Pastures

Recently there has been a trend toward better quality and productivity in pastures. The three chief causes of this trend have been:—

Use of better seed: Better seed has become available as a result of Government Certification of pasture seeds. In general the pasture species used continue to be those used formerly, but they are of known and superior strains. Broadly it would seem that the increase in the use of these better strains has been associated with an expansion in the Certification of pasture species in Canterbury. This expansion, particularly in the last few years, has been striking. It is shown partially by the following data, which indicate the extent of field inspections for Certification purposes:—

Acreage of grasses and clovers requiring field inspection for seed Certification

Season		
1940-41	..	14,052
1944-45	..	53,069
1945-46	..	66,573

The rapid expansion in seed Certification indicated in the table above has been caused by a greater appreciation by the farming community of the merits of the strains of seed grown under the Certification system. As a result today the bulk of the pasture seed sown in Canterbury is Certified seed or descended closely from seed of Certified origin.

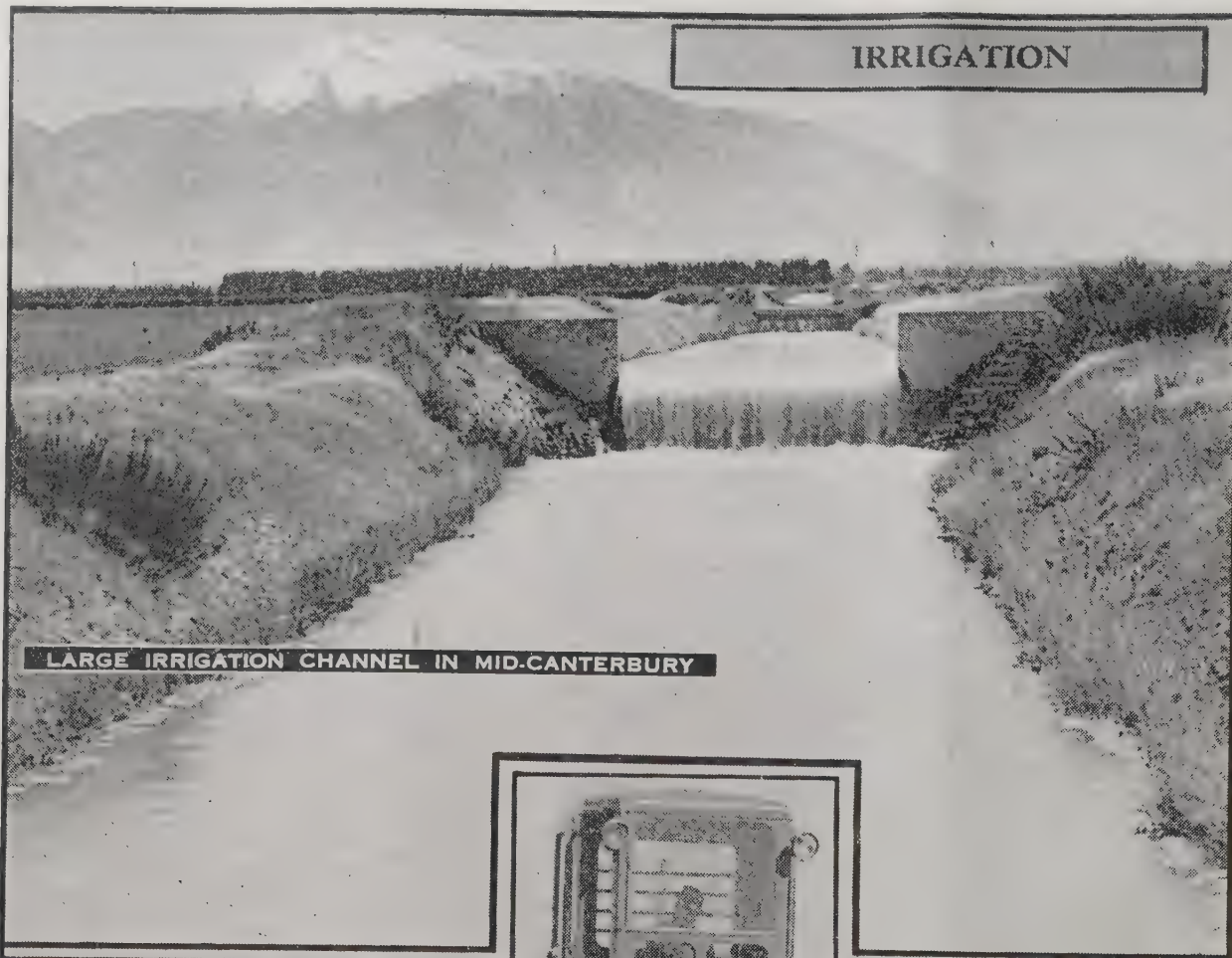
Increasing use of lime: The use of lime has greatly increased, and liming is known to bring about worthwhile improvement in pastures over wide areas. The increase in liming is indicated by the following figures:—

Tonnage of lime delivered at Canterbury railway stations

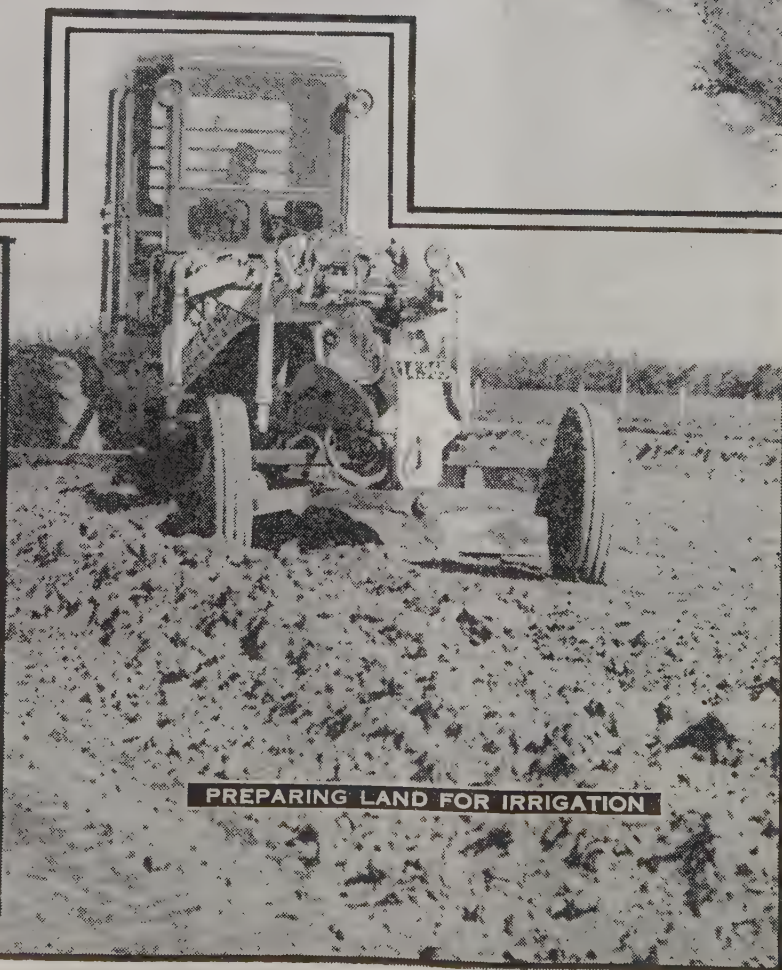
Season		
1934-35	..	16,598
1941-42	..	63,935
1944-45	..	109,335

These figures, although indicative of the trend, do not represent the full

IRRIGATION



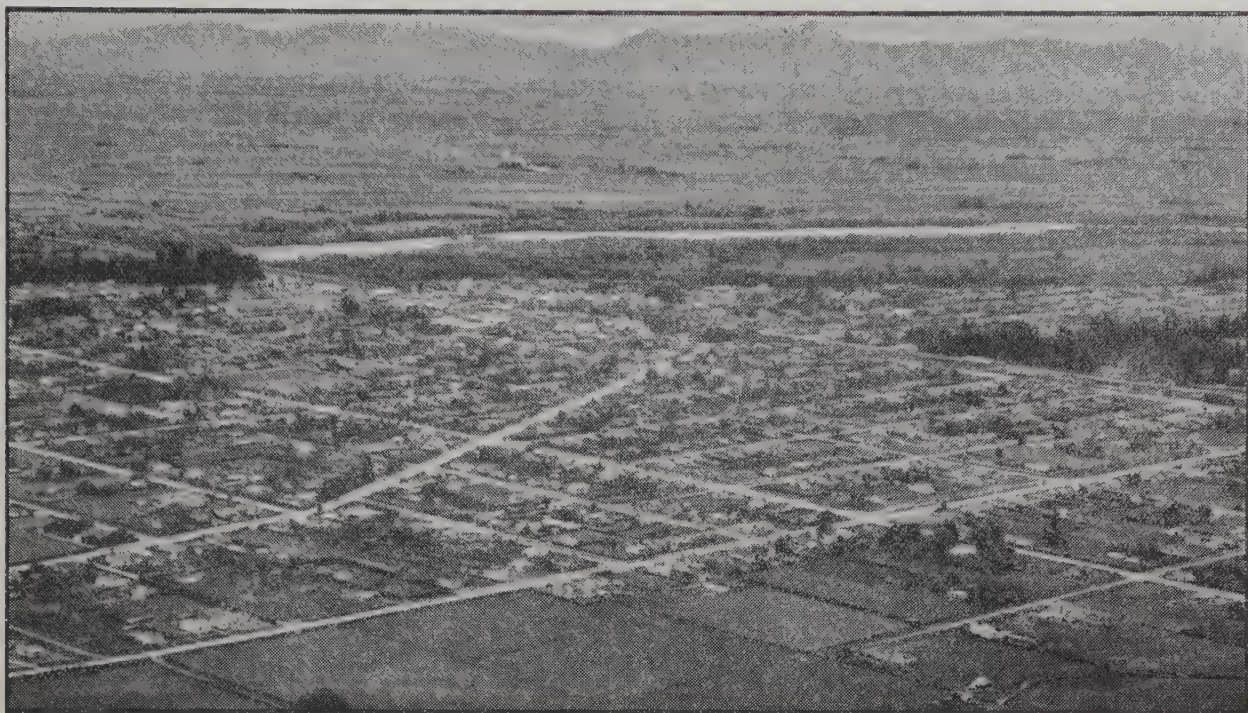
LARGE IRRIGATION CHANNEL IN MID-CANTERBURY



PREPARING LAND FOR IRRIGATION

Although some successful private irrigation has been carried out in Canterbury, the State has been responsible for the major development. For several years water has been made available by the Redcliff scheme, on the north bank of the Waitaki River, and the Levels scheme, a few miles north of Timaru. Recently irrigation has commenced under the Winchmore scheme, near Ashburton. Considerable further irrigation development has been planned, and when this is completed irrigation will be possible on 357,000 acres. Field experience has demonstrated that irrigation greatly increases the potential production of certain Canterbury land.

FARMING IN CANTERBURY



[V. O. Browne photo.]

Ashburton, agricultural and commercial centre of Mid-Canterbury, has a population of 7550. The surrounding arable plains are used largely for the production of cereals, small seeds, and fat lambs, and some dairying is carried out on the heavier land.

programme of liming, as a large quantity of lime used has not been carried by rail.

Quite often the benefit from liming is evident within a short time, but it may be that the major benefit from liming is an indirect, relatively long-term one resulting from the stimulation of clovers, which build up the supply of nitrogen in the soil and strengthen the better species of grasses in the pasture cover.

Increase in phosphatic topdressing: For about 12 years before wartime rationing the use of phosphatic fertilisers for the topdressing of grassland had been growing, as shown by the following figures:—

Area topdressed in
Canterbury with
artificial fertilisers

Year	Acres
1927-28	45,511
1937-38	158,274
1940-41	170,722

The year 1940-41 was the peak year in annual acreage topdressed, but in 1943-44 rationing had caused the acreage to fall to 63,000. Phosphates are an ingredient in all fertiliser used for grassland topdressing.

As yet topdressing with artificial fertilisers has had a very minor place in Canterbury grass farming. Probably the most significant fea-

ture is the steady increase, particularly in recent years, in the acreage topdressed. In the 1940-41 season 246 acres were topdressed with fertiliser for every 100 acres topdressed 5 years earlier. It is reasonable to assume that this increase has been caused mainly by experience being favourable. Probably the earlier topdressing was largely a trial and because of good results farmers have extended their topdressing programme.

Even in the peak year the amount of topdressing done in Canterbury was meagre in comparison with what is normal in some other districts in New Zealand. One of the reasons for this is that until recently much of the pasture work on arable ground militated against good results from artificial fertilisers. The use of inferior strains of pasture species—for example, inferior ryegrass, most of which was perennial in name only—gave swards of such a short life of reasonably good production that artificial fertiliser used on them was less effective than it is on the better swards which now can be produced reliably by the use of superior Certified strains. A second reason was that artificial fertiliser was applied to old pastures so deteriorated that inferior species such as browntop were prominent constituents, or a good

deal of ground was bare. Experience has shown that as a rule in Canterbury topdressing of land carrying such swards is inadvisable, but if the old, inferior sward is ploughed down and replaced by the better and more vigorous one which suitable strains and species of seed will give, topdressing may be well warranted. Another reason against the fullest success in topdressing pastures with phosphates has been the failure to reinforce the fertiliser topdressing by carrying out liming also, and this still occurs fairly frequently. A deficiency of lime is characteristic of much Canterbury land, and the fact that the relatively-small response from phosphates may be caused by this deficiency has often been overlooked. The expansion of topdressing in Canterbury is retarded also by the rainfall not being sufficient to allow the results being as spectacular as they are in some of the heavier-rainfall districts. This is a condition which cannot be overcome in most of Canterbury, except in those districts where irrigation is undertaken.

Surplus Summer Pasture Growth

Much of the surplus growth of pasture in summer is used in the production of pasture seed and in haymaking. A feature of the seed production is the increasing attention being given to the

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FARMING IN CANTERBURY



[V. O. Browne photo.]

Timaru, principal town of South Canterbury, has a well-constructed artificial harbour and is the second chief port of the province. In 1946 the tonnage of cargo handled was 138,847, of which 33,917 tons were inward cargo and 104,930 outward.

growing of Certified seed. The following table shows the development that has taken place recently. A good deal of this development does not involve additional seed production, but a change over to the growing of seed that is eligible for Certification.

	Acreage requiring field inspection for seed Certification	
	1940-41	1945-46
Perennial ryegrass ..	3,510	18,875
Italian ryegrass ..	3,792	13,572
*Cocksfoot ..	3,120	4,149
Short-rotation rye-grass ..	—	2,303
Montgomery red clover ..	2,978	21,823
White clover ..	215	3,870
Broad red clover ..	176	388
	13,791	64,980

*Does not include Akaroa cocksfoot.

The increased returns to farmers from pasture seed as a result of the recent developments in Certified seed production now amount

to hundreds of thousands of pounds and if the prices paid to the growers for the seed remain attractive, further considerable expansion in acreage is possible.

Haymaking today has a much larger place in Canterbury farming than it did 20 years ago, the acreage saved for hay recently being more than twice as great as that saved in the early twenties. Most of the increase is in hay from grassland, of which the area was 33,000 acres in 1942-43 and 17,000 acres in 1920-21, but there has also been a big increase in the acreage of lucerne saved for hay—15,300 acres in 1942-43 and 4700 acres in 1930-31. The use of modern labour-saving equipment such as the pick-up baler makes possible a further increase in haymaking, which would be advantageous for the better feeding of stock when grazing is scarce.

TRENDS IN PRODUCTION

Sheep Farming

During the last 25 years there has been an increase in the number of

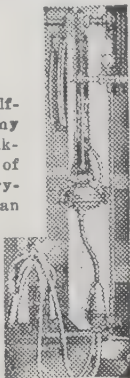
sheep in Canterbury flocks. Between 1920 and 1924 the total sheep in Canterbury flocks averaged 4,412,000 and the number of lambs tailed annually averaged 2,334,000. The corresponding figures for the 1930-34 period were 5,295,000 sheep, and 2,931,000 lambs tailed annually, and in 1944 the flocks totalled 5,313,000 and the lambs tailed numbered 2,880,000. The peak year was 1938, when there were 6,148,000 sheep and 3,397,000 lambs tailed.

The great majority of the lambs raised are slaughtered as fat lambs for the export trade, but the ratio of lambs slaughtered to the number of lambs tailed in the same season varies from two-thirds to five-sixths. The fluctuation may be caused by a number of circumstances, including an abnormally heavy flock mortality through snowstorms and other unfavourable climatic conditions, when the proportion of lambs slaughtered is likely to decrease to allow flock replacements to be made. On the other

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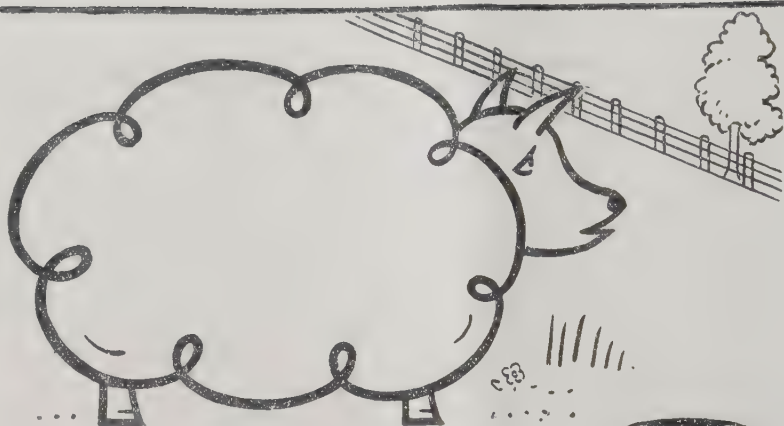
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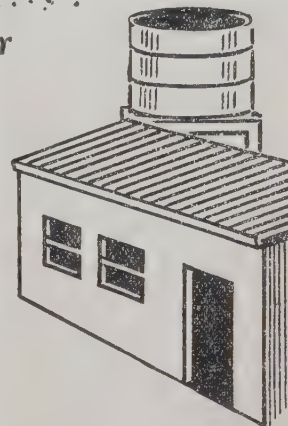
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hand if the farmer's financial position is difficult, he may dispose of lambs more freely to increase his financial returns, and carry on with sheep of greater age.

Pastures are easily the dominant crop in the feeding of the flocks, but special forage crops such as rape, kale, and turnips are grown fairly extensively both for feeding in the winter and early spring and for fattening both lambs and sheep in late summer and autumn. A considerable amount of fattening is done, however, without the use of these special forage crops and it tends to increase with improvement in the pastures.

In 1944 Canterbury flocks consisted mainly of 124,000 stud sheep entered in flock books, 2,549,000 crossbreds, and 2,639,000 sheep of distinctive breeds but not entered in flock books. The last group included 1,156,000 half-breeds, 760,000 Corriedales, 375,000 Merinos, 279,000 Romneys, 28,000 Southdowns, 19,000 Border Leicesters, and 11,000 English Leicesters. The flock book sheep consisted mainly of 18,000 Romneys, 33,000 Southdowns, 34,000 Corriedales, 11,000 Merinos, 11,000 English Leicesters, and 8000 Border Leicesters; the Corriedales, Merinos, and Leicesters in each case represent more than half the total number for the Dominion.

The day of Canterbury as a province of large sheep stations has long passed and nowadays there are less than 100 flocks of more than 5000 sheep and there are only five flocks of more than 20,000 sheep. There are, however, 1500 flocks of up to 500 sheep, 2800 flocks of 501 to 2500 sheep, and 270 flocks of 2501 to 5000 sheep, so that today relatively-small flocks predominate.

The importance of fat lamb production in Canterbury sheep farming is reflected to some extent in the large place occupied by breeding ewes in the flocks. In 1944 there were 3,348,000 breeding ewes in a total of 5,312,000 sheep and the crop of lambs has grown in importance. Twenty years ago, according to seasonal differences, 50 to 55 lambs were raised for every 100 sheep run, whereas recently 55 to 60 lambs have been raised. One of the probable reasons for this increase is a better supply of feed made possible by improved pastures.

Dairying

Although the number of holdings on which dairy cattle are milked in Canterbury (8983) is greater than the corresponding number in any other province in New Zealand, Canterbury is not self-supporting in dairy production. The reason is that on more than two-thirds of the holdings the size of the herd milked is under five cows. The total number of cows

is about 60,000. It is estimated that the production of 10,000 cows is mainly for town milk supply and that about 25,000 cows are on holdings on which dairying is only a sideline, most of these being in herds of four cows or less and the rest being in herds of from five to nine cows. This leaves an estimated 25,000 cows in commercial herds producing chiefly for butter and cheese factories. In Canterbury conditions are not as favourable for dairying as those in the principal dairying districts of New Zealand, where milder temperatures and greater rainfall allow a longer annual period of active growth of grassland and a more rapid rate of growth on soils of equal fertility. The Canterbury dairy farmer endeavours to overcome this disadvantage by depending less on the stock feed directly available from grassland and by using more hay and special arable crops, both root crops and green forage crops, for use when the feed directly available from grassland is short. Some evidence that many Canterbury farmers have a considerable measure of success with this system is given by the fact that the Canterbury average annual production of butterfat per cow under the group system of herd testing was 266lb. in the 1943-44 season and 294lb. in 1944-45, the corresponding Dominion figures being 254lb. and 280lb. respectively.

The size of the Canterbury dairy industry in recent times has been con-

stant, apart from the effect of the Second World War. In the five-year period ended 1930-31 the average number of cows milked a season was 72,100, and 10 years later the average number of cows milked for the five-year period ended 1940-41 was 72,300. The corresponding figure for 1943-44 was 59,600 cows, and in the peak year of 1934-35, which was also the peak year for the Dominion, 83,200 cows were milked in Canterbury. There has been an increase in the number of cows in the herds on dairy farms registered for town supply. In the Christchurch district this increase in a recent decade has been about 3000. The milk produced by these additional cows would serve partially, at least, to meet the growth that has taken place during the same period in the population of Christchurch.

Pig Production

In recent years there has been a decline in pig production. The average annual number of pigs on Canterbury farms as at January 31 was 45,000 during the five-year period ended 1940-41; for the five-year period ended 1930-31 the corresponding figure was 50,000 pigs. Under war conditions the number fell to 32,000 in the 1943-44 season.

As in New Zealand generally, pig production in Canterbury is closely associated with dairy farming. An important consideration in pig production is that dairy by-products such as skim-milk are saleable only to a

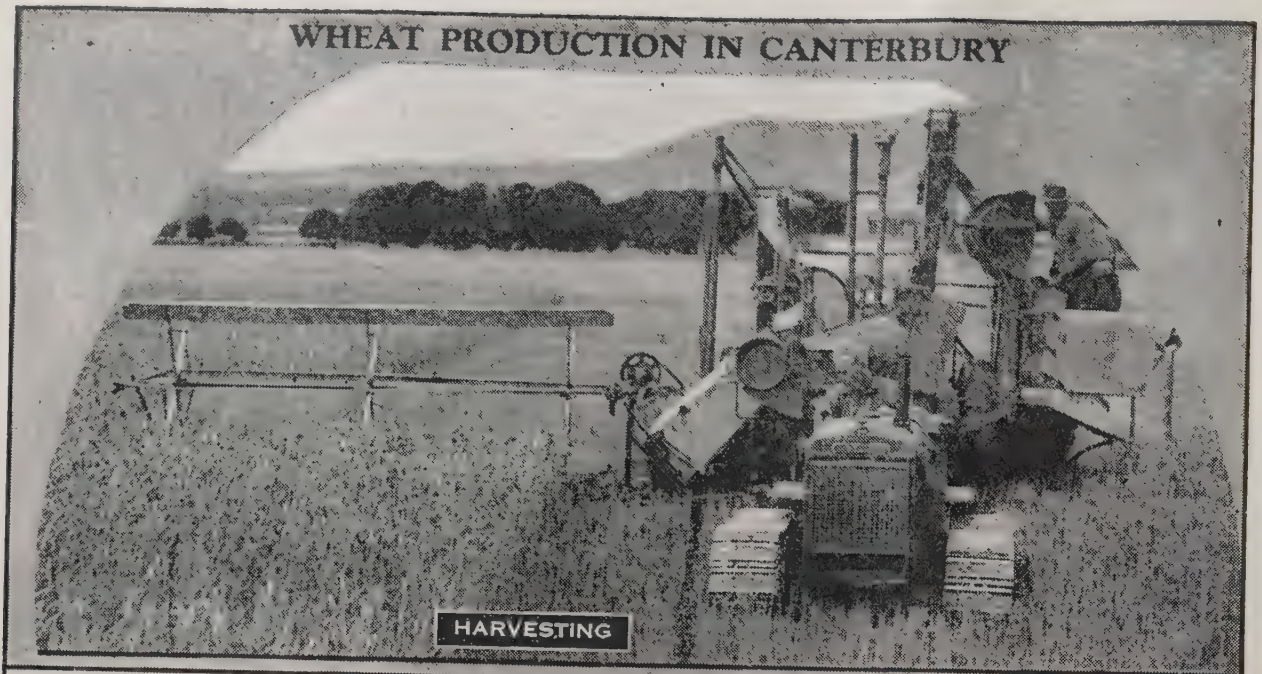
FARMING IN CANTERBURY



[Green and Hahn Ltd. photo.]

Small holdings are an important feature of Canterbury farming. On this market garden in the Papanui-Harewood district, near Christchurch, rhubarb is being prepared for despatch to market.

WHEAT PRODUCTION IN CANTERBURY



HARVESTING



THRESHING

Canterbury is the principal arable-cropping district of New Zealand and of the cereals grown wheat is the major crop. In 1943 the area used for wheat growing was 184,800 acres, but since then there has been a sharp drop in the acreage. About 80 per cent. of the Dominion's wheat crop is grown in Canterbury.



WHEAT STACKS

limited extent, but when fed to pigs, for which they are highly nutritive, they can be converted into food for human beings. The recent decline in Canterbury pig production follows mainly the same trend as that which has occurred throughout the whole Dominion, and has the same causes—labour difficulties and an easing of the economic pressure that has prompted attention to sidelines in the past. In addition, it is likely that there has been a shrinkage in the supply of inexpensive feed partly because of a greater portion of the whole dairy supply being required for milk for human consumption and partly because of changes in crop production.

Arable Cropping

In comparison with the position occupied by arable cropping in many overseas countries of relatively-heavy population the proportion of ploughable land that is devoted each year to arable crops in Canterbury is small. This is caused partly by the tendency to economise in labour rather than in land. Although there are exceptions, the organisation of farming generally tends to give a high production per unit of labour rather than per unit of land. In 1944, the latest year for which data are available, the area sown in arable crops was 605,000 acres, including 130,000 acres sown also in new pasture, and the area of sown grassland was 2,000,000 acres. At times in the past the proportion of arable crops to sown grassland has been higher.

That Canterbury stands out as the arable-farming province of the Dominion is shown by the fact that in 1944, 605,000 acres of arable crops out of a Dominion total acreage of 1,250,000 acres were grown in the province. Arable farming is of importance also in Otago and Southland, each having an annual acreage of about 200,000, which is also the annual acreage of the whole of the North Island.

The arable crops of Canterbury fall into the following main groups:—

1. Cereals and other crops for threshing, including peas, linseed, mustard, rape, etc. The area sown in these crops recently has been about 370,000 acres, and during the past 25 years it has been as high as about 500,000 acres.

2. Green fodder and root crops such as rape, kale (including chou moelleri), turnips, and mangolds, the area of which recently has been about 240,000 acres. This acreage indicates a tendency toward a decline which has been in evidence over a period of several years, but which is not as

FARMING IN CANTERBURY



[Green and Hahn Ltd. photo.]
Raspberry spraying on a small holding at Riccarton, on the outskirts of Christchurch.

great as occasional statements suggest; the area 25 years ago was about 300,000 acres.

Crops for Threshing

Wheat: Wheat is the major cereal in Canterbury, which nowadays grows about 80 per cent. of the wheat produced in the Dominion. Since 1943 the acreage has dropped sharply, and whether the reduced acreage will remain permanent will depend on future circumstances. Regularly in the past the acreage has fluctuated substantially from year to year. The average yield an acre also has fluctuated considerably, the variation being caused mainly by differences in the seasons. During the ten-year period ended 1942-43 the yield ranged from about 26 bushels an acre to 36 bushels an acre. Only twice in that period the yield was below 30 bushels; usually it was between 32 and 33 bushels. In the past 25 years the yield of wheat an acre in Canterbury has been fairly constant and it seems unlikely that the average yield in future will be smaller. In fact an increase in yield an acre is a possibility partly because of the greater fertility resulting from the building up of the soil due to improved pastures and partly because of advances research may give, such as better varieties or more productive methods of culture.

Wheat is grown almost throughout the arable belt on a variety of soils ranging from the heaviest and most fertile, where yields are excellent, to quite light soils, on which yields may be such that wheat growing is justified only because it fits in well with other types of farm production.

The main varieties are Cross 7, Tuscan, Fife Tuscan, and Hunters, Cross 7 being easily the principal variety, as it occupies more land than all the others together. In a relatively-small district south of Waimate Dreadnought is the most popular variety, Cross 7 being second. Normally the pests and diseases that affect wheat can be kept in check satisfactorily by reasonably-efficient culture and suitable control measures. Crops are occasionally damaged by hailstorms, frosts, winds, and excessive rain, but the total loss from all those causes in any one season is almost invariably quite small. A system of seed certification is in operation; normally this assures a good supply of seed wheat, basic considerations being varietal purity and the checking of the perpetuation of disease and weeds.

Oats: Oats are an important crop in Canterbury, which grows half of the Dominion's acreage. Chiefly because horses have been largely replaced by motor vehicles the acreage of oats has declined substantially during the past 20 years. During the three-year period ended 1942-43 the average acreage for grain and chaff was 112,000 acres, whereas 20 years earlier it was 212,000 acres. The acreage of oats grown nowadays for feeding off is much greater and ranges from 40,000 to 50,000 acres annually; 20 years ago it was 10,000 to 15,000 acres. There seems to be an upward trend in the yield of oats an acre, and during the 10 years ended 1942-43 it ranged from 31 to 44 bushels an acre; in eight seasons it was above 37 bushels. Oats are grown throughout the arable belt, and on the poorer soils are more freely

The upper and middle illustrations on the opposite page are from photographs by Green and Hahn Ltd., and the lower from a Public Works Department photograph.

ARABLE CROPPING AT MARSHLAND



HARVESTING ONIONS

Having high natural fertility, which has been maintained by efficient soil management, Marshland, five miles north of Christchurch, has become an important arable-cropping district. Crops of onions, potatoes, carrots, parsnips, and peas are grown, but onions, which regularly occupy from 300 to 400 acres, are the principal crop, yields being both consistent and good, and often reaching 20 tons an acre.



RAKING PEAS BEFORE HARVESTING

grown than wheat. Under efficient management, control of pests and disease is effective and inexpensive.

Barley: Barley, although not grown as extensively as wheat or oats, is of importance. The Canterbury acreage is about three-fifths of the Dominion acreage, a substantial part of the crop being used for malting. Recently from 15,000 acres to 25,000 acres have been sown annually, 1500 to 2000 acres usually being used for feeding off. About three-quarters of the acreage is in North Canterbury. During the 10 years ended 1942-43 the yield ranged from 26 to 48 bushels an acre and only once was it below 33 bushels an acre. Control of disease is quite satisfactory.

Potatoes

In the last 10 years potatoes, an important crop, have regularly occupied 12,000 to 14,000 acres, although during the war the acreages varied considerably, 7600 acres being grown in 1941-42 and 15,700 acres in 1943-44. Normally Canterbury grows more than half the acreage of the Dominion. Yields during the 10 years ended 1942-43 ranged from $4\frac{1}{2}$ to $7\frac{1}{2}$ tons an acre and in only one season during that period was it below 5 tons an acre. The main potato districts are the Waimairi and Paparua Counties, near Christchurch, the Waimate County, particularly the Studholme-Morven coastal region, and considerable areas in the Ashburton, Ellesmere, and Rangiora-Kaipoi districts. An important modern development is the greater attention given to Certification of seed. The area entered for Certification recently has exceeded 6000 acres in comparison with about 2000 acres 10 years earlier. Seed Certification is now accepted as a means to better crops mainly because it results in less of the insidious virus troubles and also because it encourages varietal purity.

Miscellaneous Cash Arable Crops

About three-fifths of the total Dominion acreages of peas are grown in Canterbury. The crop is widely grown, the main districts being Ashburton and Ellesmere. During the war the acreage greatly expanded, reaching about 30,500 acres in 1943-44 compared with 8500 acres in 1938-39.

Onions, an important crop only in the Marshland District, near Christchurch, regularly occupy from 300 to 400 acres and yields are both consistent and good, many being more than 20 tons an acre. However, this yield is likely to be reduced considerably in the interval between harvesting and marketing by storage losses, which in a season unfavourable for harvesting may be really severe.

It may be expected that linen flax, which became a field crop of importance during the war, will be continued on a scale sufficient to meet the bulk of the local requirements for

FARMING IN CANTERBURY



Canterbury normally grows more than half the potato acreage of the Dominion. Bagged potatoes are shown here being loaded in South Canterbury by a mechanical loader.

fibre. The crop will be confined to the districts where success has already been obtained with it—Methven and South Canterbury—and the acreage probably restricted to that which the present five factories require, about 4000 to 5000 acres.

The extensive growing of linseed is being revived through the establishment of a linseed-processing factory at Dunedin. The acreage may become considerable, perhaps 15,000 acres or more, but it will be determined by economic circumstances.

About 1000 acres are devoted each year to seed production of arable crops, mainly rape, kale, and mustard.

Green Fodder and Root Crops

In the 10 years ended 1939-40 about 250,000 acres were devoted annually to green fodder and root crops, not including greenfeed cereals. The acreage was well maintained during the war and was 238,000 in 1943-44. About 130,000 acres are sown in turnips, including swedes, which recently have occupied less than 20,000 acres. About 100,000 acres are devoted to rape and kale.

The forage and root crops are of more importance in Canterbury farm husbandry than the size of the area they occupy might indicate. Of great value is their role as pasture supplements and they are used to fatten stock in summer and to maintain them in suitable condition in winter and early spring, when the feed directly available from pastures is likely to be very much below the current requirements of the stock. As these crops may often be suitably included in a

rotation between the ploughing up of old deteriorated pasture and its replacement by new superior swards, a decline in such crops in Canterbury over a number of years would result in a greater falling off in livestock production.

Mechanisation in Farming

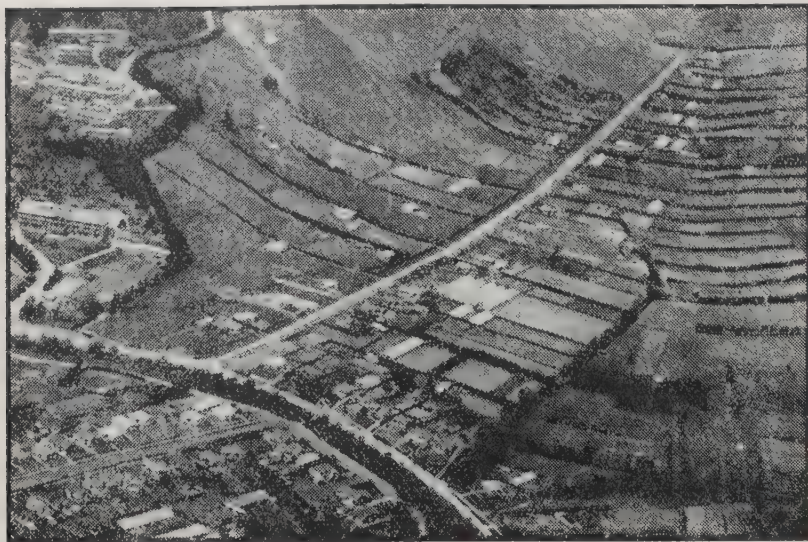
Outstanding in Canterbury farming during the past 20 years has been the increase in farm mechanisation. In 1923-24 there were fewer than 100 tractors on Canterbury farms; at present the number of tractors is about 4000. Of great importance also has been the increased use of header harvesters, modern haymaking machinery, including the pick-up baler, farm trucks, and electric motors.

A good deal of tedious and heavy work undoubtedly has been eliminated by the introduction of this machinery, but the long-term influence of mechanisation on Canterbury farming has not yet been determined. At this stage it would be rash to claim that the present mechanisation has been wholly advantageous to the farming community.

Social Services

Rural Canterbury is well served by public utilities and amenities. The South Island main trunk railway, which runs through the length of the province, gives good access north and south and is supplemented by sealed highways of easy grades. The Midland railway, which joins Canterbury to Westland, enables timber and coal

FARMING IN CANTERBURY



[V. O. Browne photo.]

The Bowenvale Valley, Cashmere, one of several valleys round the Port Hills, Christchurch, where commercial orchards are established. The chief products at Bowenvale are small fruits and tomatoes.

supplies to be brought to Canterbury and allows tourists from Canterbury to visit all the scenic attractions of the West Coast. The access by road to farm holdings is generally good. Lyttelton normally has a daily steamer express service with the North Island, and the harbours at both Lyttelton and Timaru accommodate overseas liners which call to load such products as meat and wool and to embark passengers.

Electric power is available in much of rural Canterbury for use both in the home and in farm work.

There is a varied range of easily-accessible tourist and holiday attractions—pleasant seaside resorts at Timaru and Akaroa, alpine attractions at Mt. Cook, rivers and lakes with attractive fishing and shooting, and hot springs at Hanmer.

Canterbury is well provided with educational facilities. There are State and private primary schools and secondary schools throughout the province, and university studies may be undertaken at Canterbury University College, Christchurch, in a wide range of subjects and at Canterbury Agricultural College, Lincoln, in agriculture.

Potentialities of Production

Apart altogether from any future advance in farming knowledge, the more general and thorough application of the knowledge already available of efficiency in crop husbandry would result in a substantial expansion in economic farm production. The main measures that would serve to give this expansion are:—

Use of better pasture seed: There is

scope not only for the more extensive use of the best available lines of pasture seed on land where normally it has been little used, but for its more frequent use at times by farmers who have established high-class pastures by using the best strains of seed available at the time. Some farmers persevere too long with pastures which have deteriorated so much that it would be profitable to plough them up and replace them with new high-class pastures. The more frequent replacement of deteriorated pastures with better ones is likely to bring about a greater annual area of arable crops. To be fully effective the more extensive use of superior strains of seed usually must be linked up with liming and phosphatic topdressing.

Greatly-expanded programme of liming: Increased production would result from liming on the greater part of the 2,000,000 acres of arable grassland in Canterbury. At no stage has the acreage limed in a year reached 200,000 and in recent years it has been about 150,000. In view of the big scope for an increase in liming it is fortunate that Nature has freely endowed Canterbury with accessible, well-distributed outcrops of limestone suitable for agricultural use after grinding. Today the demand is so great that prompt delivery of orders is impracticable and a substantial increase in supply is being planned.

Phosphatic topdressing: An increased programme of phosphatic topdressing would result in widely-increased production. Over a long period of years official field trials and observations of farm results have indicated

that much grassland benefits from the use of phosphatic fertilisers and that a substantial increase in Canterbury's programme of phosphatic topdressing is warranted. However, owing to climatic conditions the use of phosphatic topdressing is not likely to become as extensive as it is in certain other major farming districts in the Dominion. To be most effective phosphatic topdressing must be associated with liming on good swards.

Wider use of lucerne: More extensive use of lucerne as a supplementary crop to pastures is already in progress and is likely to continue with the introduction of labour-saving equipment and a wider knowledge of the value of lucerne.

Subterranean clover: An extension in the use of subterranean clover under suitable circumstances, particularly on the light plains land and similar soils, would assist to increase production.

Irrigation: Irrigation, particularly in the drier parts of Canterbury, is an important factor in increasing production. This has been demonstrated already where water has been available for a number of years, as in the Redcliff district, on the north bank of the Waitaki River, at Levels, a few miles north of Timaru, and at Winchmore, near Ashburton. Water for irrigation is available for more than 82,000 acres and much of the engineering work required to make water available for more than 100,000 acres additional land in Mid-Canterbury has been carried out.

Conclusion

In its farming Canterbury has a good record of initiative, imagination, effort, ability, and achievement. Under existing conditions further economic development of farming in Canterbury is possible, and if there is a continuation of the sound endeavour that already has had such outstanding results, there is clear promise of continued increased production that will promote the general well-being not only of Canterbury, but of the whole Dominion.

Radio Broadcasts

RADIO talks to farmers will be given from Station 1YA Auckland at 7.15 p.m. on the following dates:—

December 1—"Clean Milk Production," by T. A. Coulter, Dairy Inspector, Christchurch.

December 8—"Current Farming Problems," by E. B. Glanville, Assistant Fields Superintendent, Auckland, and P. S. Syme, Instructor in Agriculture, Warkworth.

Farm news sessions are broadcast over main national stations every Thursday at 9.20 p.m., but there will be no session on December 25.

SPRAYING EQUIPMENT FOR THE HOME GARDENER

By A. G. KENNELLY,
Instructor in Vegetable Culture,
Christchurch.

THE choice of efficient and economical spraying equipment is very important to the home gardener. Some of the many variations in the types of hand-operated spray equipment available are as follows:—

Hand Syringe: This type was evolved mainly to meet the needs of gardeners engaged in glasshouse or propagating work. It is useful for syringing plants and, when used with a coarse nozzle, for "damping down." For spraying for the control of pests and diseases it is usually at best a makeshift, most types being rather wasteful of spray, and because it must be frequently dipped in the spray container to be refilled, it is only suited to the spraying of individual plants or small groups of plants.

Hand Sprayer (Atomiser): The hand sprayer (Fig. 1) is suited only to small gardens and its use is confined to a limited range of spray specifics. It has attached as an integral part a small container for the spray liquid. The action is usually continuous and within the limitations set by its size and output it is very effective in action.

The ordinary fly sprayer, though much lighter in construction and simpler in design, is an example of the type.

The type sells at about 15s.

Hand Powder Duster: The powder duster (Fig. 2) is a handy and effective piece of equipment for the home garden. It has quite a wide range of application and in appearance is somewhat like the hand spray, with a container similarly attached from which dust is automatically withdrawn and directed continuously at the object being dusted.

Powder dusters are especially suited to the home gardener, for by their use the need for mixing spray—a rather tiresome and time-consuming operation that most home gardeners would gladly forgo—is obviated.

The Horticulture Division recently completed trials to determine the relative effectiveness of certain of the new

insecticides such as D.D.T., and it is with these, together with the older-established insecticides having as their active agent rotonene (which though effective against many insects had the important disadvantage of being relatively ineffective against aphides), that the powder duster can fulfil a most useful purpose in the home garden.

Dusting Versus Spraying

Some disadvantages of dusting are:

1. Certain diseases and, until recently at least, some insect pests could not be effectively controlled by dusting.
2. The adhesion of dusts is inferior to that of sprays, and consequently applications usually have to be made more frequently.
3. Dusts can be applied only in the absence of wind, and in New Zealand this very often means that the dusting must be done during early morning or evening.

Some advantages of dusting are:

1. No measuring or mixing is required.
2. The speed of application is usually two or three times as rapid.
3. Less strongly-adhering residue needs to be removed from dusted produce in preparation for cooking.
4. The need for carrying heavy buckets of spray liquid is obviated.

Good type dusters are on sale at about 12s. to 15s.

Double-acting Hand Sprayer (Fig. 3): This is actually a continuous-acting syringe and is one of the most useful sprayers for the home garden. It consists of a simple double-acting pump which delivers a continuous spray sucked through a length of flex-

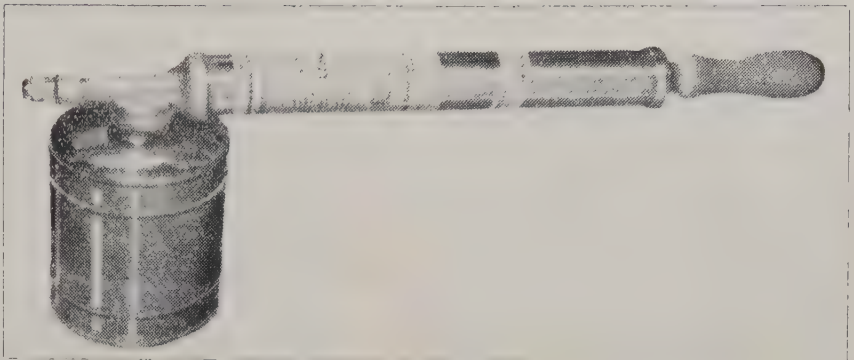


Fig. 1—A hand sprayer.

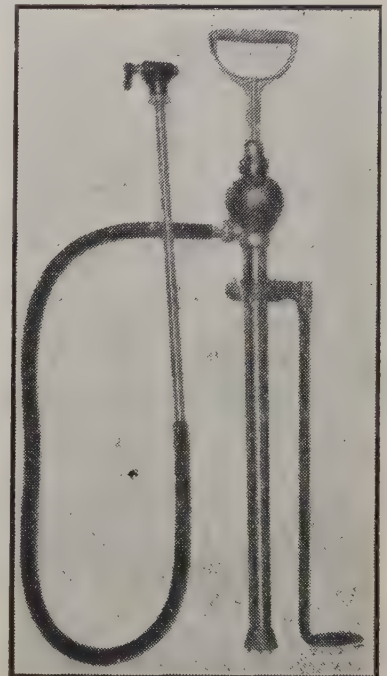


Fig. 4—A bucket pump.

ible hose, the end of which is kept in the spray container.

The cost is generally about 30s. to 35s.

Bucket Pumps (Fig. 4): The best and most expensive kinds are double acting and have a bulbous pressure chamber which ensures that once pressure has been built up it can be maintained continuously with only a moderate pressure on the pump handle. There

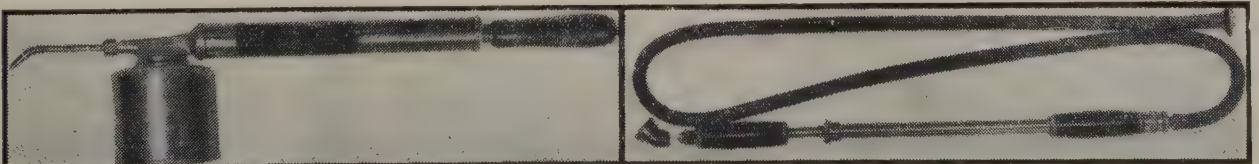


Fig. 2 (left)—A hand powder duster. Fig. 3 (right)—A double-acting hand sprayer.

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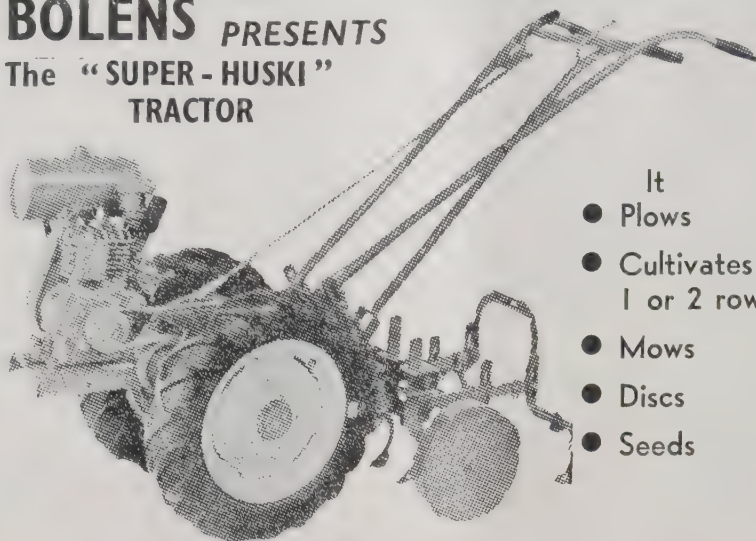
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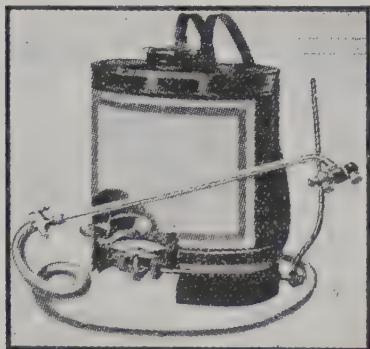


Fig. 5—A knapsack sprayer.

are good light and heavy types available, but for the most efficient results it is usually preferable to have one person pumping and another directing the spray. For this a good length of flexible hose is desirable.

Excellent types are available at from 30s. to 40s.

Knapsack Sprayers: Knapsack sprayers (Fig. 5) are designed to be carried on the back and are operated by pumping with the right hand while the left directs the spray. Knapsack sprayers sell at about £5 to £7, but unless there are numerous fruit trees to be sprayed, they are usually considered too costly and elaborate for the home gardener.

Barrow Type: The barrow type sprayer, which consists of a powerful pump and large tank mounted on wheels, was at one time commonly used in smaller commercial gardens, but was rarely used by home gardeners and has now been largely superseded by the small power sprayers.

The ideal in spraying is a coverage of fine droplets over all plant surfaces

without run-off of spray, but this is not possible in practice because by the time inaccessible portions of foliage have mist coverage exposed portions are wet. This leads to uneven distribution of spray residues, and also a certain amount of waste, but is preferable to missing any portion of the plant. The importance of using the correct type of nozzle can hardly be over-emphasised.

Spray Nozzles

Many home gardeners are not aware of the importance of using the correct type of spray nozzle. For most horticultural purposes nozzles are of two main types: (a) the cyclone nozzle (Fig. 6) and (b) the Bordeaux nozzle (Fig. 7).

Cyclone Nozzle: The cyclone nozzle is now recommended for practically all orchard and garden spraying because more nearly than any other type of nozzle, it conforms to the ideal of producing the finest droplets, greatest depth of penetration, and greatest volume of delivery, with the minimum amount of frictional loss and at moderate pressures. The principal parts of the cyclone are the disc, whorl chamber, whorl plate, and strainer. The disc is easily replaceable and the range of apertures thus obtainable provides a variation in the fineness of the droplets, though of course this, together with depth of penetration and volume of delivery, is also influenced by pressure. High nozzle pressure has the advantage of giving greater penetration between the leaves, quicker coverage with less wastage, and of breaking the spray into a fine mist.



[Green and Hahn Ltd. photo.]

Fig. 6—A cyclone nozzle.

The Bordeaux Nozzle: With this type of nozzle the liquid is forced through a tapered aperture drilled in a stopcock so that it may be adjusted to produce a solid stream or fan-shaped spray. The latter is formed where the emerging stream is caused to impinge against a bevelled flange.

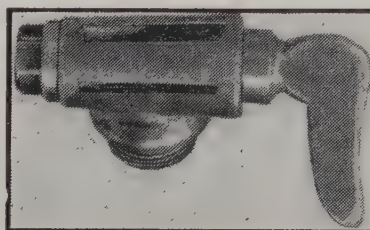


Fig. 7—A Bordeaux nozzle.

The resulting spray is coarse and in the effort to obtain adequate coverage much of it will run off and be wasted.

The Hose and "Lance"

Hand-operated spray pumps when first bought are often fitted with a hose of inadequate length. Six to eight feet should be considered the minimum for average requirements. The hollow extension rod or "lance" to which the nozzle is attached, and which is used for directing the stream of spray, is also often too short. Eighteen inches should be regarded as a minimum length. Adequate length is very important; it reduces the risk of spray splashing back on the face, hands, or clothes of the operator and enables the stream of spray to be directed past heavy foliage into the heart of the plant. If the spray lance is bent near the nozzle or the nozzle made so that it can be screwed on at an angle, it will add to the effectiveness of the sprayer.

SPRAYING POINTS

Spray thoroughly and at the correct time.

Respray after heavy rain, especially if the spray has not had time to dry.

DO NOT try to spray from only one angle. Several angles are necessary for complete coverage.

Choose a calm day for spraying. Nicotine sprays are most effective in hot weather.

Clean out pump, hose, and spray container after use by forcing clean water through. This is most important, particularly after using some of the newer hormone sprays. Several washings with hot soapy water and washing soda and a rinse with kerosene may be necessary in these cases, and it will also be advisable to replace rubber or leather washers.

Keep poisons such as nicotine sulphate and arsenate of lead un-

der lock and key and see the labels are intact.

DO NOT mix more spray than is required and then carelessly leave the excess where it is accessible to children. Pour it away into a hole in the ground. Most sprays deteriorate if kept.

Keep rubber spray hoses in a cool, dark place. Sunlight will cause them to deteriorate rapidly.

Oil the plunger rod and cup leathers of the spray pump periodically. Dust guns also need cleaning and oiling periodically.

When in doubt as to the identification and control of pests and diseases, consult your nearest field officer of the Horticulture Division, Department of Agriculture. Expert advice that embodies the results of the latest research both in New Zealand and overseas is available free.

Success of a South Canterbury Rural Settlement

THE provision of housing for workers in country districts has long been a problem for New Zealand Governments, and at present is one of the shortages standing in the way of increased food production. In this article R. H. Scott, Field Economist, Rural Development Division, Christchurch, looks at what was done in the past and analyses the success of a rural settlement established in South Canterbury in 1913.

IN 1910 the Workers' Dwellings Act was passed, repealing a somewhat similar Act of 1905. The Act was designed to make better provision for the erection and disposal of workers' houses, and when the Bill was introduced into Parliament the Minister of Labour explained that one of its main objects was to attempt to overcome the problem of the high rents then charged to workers in New Zealand. Under the provisions of the Act the Government was empowered to buy land or set aside Crown land, subdivide it, and erect houses on the sections. They could be rented on a weekly tenancy or leased for 21 years with a right of renewal, or a worker could enter into an agreement to buy, payments of interest and principal being spread over 25½ years, after which the freehold passed to him. A worker was defined as a person employed in work of any kind whose earnings did not exceed £175 a year and who was landless.

It was originally decided to fix the maximum capital value of a worker's home at £600, to cover the cost of the acquisition of the land, surveying, and building the house. With rising costs that figure was subsequently raised, as was the limit to the workers' earnings.

Extension to Rural Areas

Up to the passing of the 1910 Act 127 workers' houses had been built under the provisions of previous legislation, but only in the four main centres. Not until 1912 did the Government decide to extend operations to country districts, the object being expressed as follows in the 1913 annual report of the Labour Department: "It is expected that the workers resident on areas subdivided for workers' homes in the country will be enabled to carry out farming in a small way on their own account, in addition to performing their ordinary duties as employees in the respective districts."

The first block of land acquired in a rural area was one of 65 acres bought in 1913 at Willowbridge, South Canterbury. The area, the Berensden Settlement, was subdivided into 13 sections, which after allowing for roading were about 4½ acres each, and the first buildings were completed in 1914. The four-roomed houses cost

about £360 and the five-roomed ones about £450. The total capital value of the buildings and land ranged between £550 and £650, and the outgoings to cover repayments of the capital value, interest, and fire insurance averaged 16s. a week for the four-roomed and 17s. 2d. for the five-roomed houses.

The settlement is on the railway and alongside a siding about midway between Timaru and Oamaru. The train services enable residents to spend a day in either of these towns, and the proximity to rail is an added advantage to those engaged in part-time market gardening. The school is on a section in the settlement, and the district hall, reported to be one of the best in this part of South Canterbury, is close. On land alongside the hall are tennis courts. The borough of Waimate is only five miles distant, with a first-class road between.

Farming at Willowbridge

Willowbridge is the centre of an intensively-farmed district where the soil is for the greater part a rich alluvial silt, and, though mixed farming is the main feature, the district is perhaps best known as a major potato-growing area, where yields are among the highest in New Zealand. The growing of cereals, pulse crops, potatoes, small seeds, and fat lambs, with the attendant provision of supplementary fodder crops, forms the pattern. Though mechanisation of farm work has been carried to considerable lengths in the area, the nature of the farming practices still calls for a large labour force.

Shearing takes place during December and January, followed in February, March, and April by the harvesting of the grass, cereal, pulse, and clover crops. Harvesting is no sooner completed than the potato crops have to be lifted, which in a normal season is completed by early June; then comes the grading of the potatoes and, though that is often done by a contractor, it still means the employment of a grader team of up to five men. In an area where creeks are numerous, ditch cleaning takes its turn in the winter months, as do the trimming of live hedges and the repair of fences. With this work over, the next year's potato area is ready for planting and October passes. Haymaking is the next opera-

tion, and the year probably finishes with this and shearing under way.

Reasons for Success

In a district such as this, where only adverse weather can cause a comparatively-slack period in farming operations, continuity of employment of a resident labour force is practically assured. This factor more than any other has been the reason for the success of Berensden Settlement.

Local farmers are emphatic that it has filled a real need, and other reasons advanced by them for its success are:—

The land on which the houses were built was some of the best in South Canterbury, and thus settlers were able to obtain portion of their living from the holdings.

Ease of access to the towns of Waimate, Timaru, and Oamaru because of proximity to rail.

Proximity to a primary school, and the ease with which pupils can reach secondary schools at Waimate and Timaru.

The annual payments on the properties were relatively small.

With the passing of time—the settlement is now more than 30 years old—the question arises whether it is still a reservoir for skilled farm personnel, and an investigation shows that to be the case. There are still nine men in the settlement whose livelihood is gained by working in the district; they are either skilled farm workers or agricultural contractors, and all of them give a real service to their district.

A visit to the settlement shows the houses to be well cared for. Some sections are cultivated for market garden crops, cows are in evidence, most of the houses have a telephone, and some residents have a car. In general, the settlement has an air of well-being which alone bears testimony to its success. Berensden Settlement may in the future advance further and be the focal point of a thriving community centre for the surrounding district, for already the nucleus facilities are there.

Pig Broadcasts

UNDER the auspices of District Pig Councils broadcasts will be delivered in December as under:—

Auckland—1YA, on December 17, at 7.15 p.m., "Points to Remember in General Management," by C. W. Wallace, Supervisor, Waikato District Pig Council.

Palmerston North—2ZA, on December 19, at 7 p.m., a talk by L. Marsdon, Supervisor, Wellington District Pig Council.

Napier—2YH, on December 11, at 7.15 p.m., "Maintenance of Layout," by N. Hopkins, Supervisor, Tairāwhiti District Pig Council.

METHODS OF INCREASING FOOD PRODUCTION

By D. MARSHALL, *Livestock Superintendent, Livestock Division, Wellington.*

THREE methods are available to effect a rapid increase in New Zealand's primary production: Better feeding at two critical periods of the year, increased stocking, and a reduction in mortality. Particularly in the North Island, production depends largely on pasture. The country's best pastures are probably superior to anything else of the kind in the world. Rainfall and temperature allow of growth practically the year round, but in all districts there are periods of maximum and minimum growth. One factor in man's progress toward civilisation has been his recognition of the need to carry forward food supplies from times of plenty to meet periods of shortage and his finding means to do it. New Zealand farmers still count overmuch on the winter being not too severe, and there is still too great a disparity between the summer plenty and winter scarcity.

STOCK are often overfed at certain times of the year, a process which the late Mr. M. Scott, Superintendent of the Pig Industry, called "using the animal as a storehouse." Fat accumulated during periods of generous feeding serves as a reserve to be drawn on when feed supply falls below a maintenance ration. It is a principle which must operate extensively in wild animals and within limits, to deal with short periods of insufficient food or in country where food conservation is difficult or impossible, it has its place in domestic animal husbandry. Carried too far it is the lazy or inefficient husbandman's excuse for failing to store sufficient reserve food, such as hay. Too often in the winter stock, particularly dairy stock, are on less than a maintenance ration and lose weight.

Natural feed supplies—pasture—may be lacking either in amount or in important qualities at two periods: During the first three months of the year and in the winter.

Summer Droughts

If drought conditions occur during the early part of the year, production from milking cows dependent on pasture will decline rapidly. That occurred widely and on a serious scale in 1946. Not only is pasture dried up and reduced in quantity, but the proportion of milk-forming protein is lowered. If production is even to be maintained at a lower level where some recovery can be expected after the autumn rains, some succulent supplementary feed is necessary.

Probably the best and, on the whole, most economically-produced feed for that purpose is silage. Its making is not unduly hampered by the weather, and fields

cut for silage have a chance to make some growth before the driest part of the year. In the past some unjustifiable prejudice has existed against silage as a feed, but both young stock and milking cows have been wintered on silage alone with excellent results.

Greenfeeds such as soft turnips, maize, and millet may be grown. Lucerne is a fodder crop which should be much more widely used in many of the North Island dairying districts where it can be grown successfully

Improved methods in the handling, management, and particularly the feeding of New Zealand's flocks and herds offer the most immediate route to the urgently-required increase in the production of meat and dairy produce which will aid Britain in her present difficulties. This article is the first of a series designed to lead to a raising of standards of animal husbandry and a reduction in the incidence of disease and mortality.

and where autumn drought may be expected. Cut green it is a succulent and valuable dry-weather feed, and any surplus can be made into silage or hay, valuable for all classes of stock. Advice about the establishment of a lucerne stand may be had from any officer of the Fields Division, and Bulletin 155 (free from any office of the Department) covers the subject fully.

Though the drought of the 1946 autumn had serious effects on sheep in Hawke's Bay, Poverty Bay, and elsewhere, this season is usually less of a worry to the sheep farmer and his problem may be to keep his ewes from becoming too fat. Late lambs or those

not sent to the works off their mothers are usually finished on greenfeed, and for that purpose rape is the crop most widely grown, particularly in Canterbury and Otago. On the Animal Research Division's Manutuke Station thousand-headed kale was shown to have a sheep feed production double that of rape and to be an outstanding crop for the purpose in Poverty Bay.

Winter Shortages

Feed shortages are more regular in their occurrence and more general in their effects during the winter. Dairy herds are dry for a portion of this time, but require adequate feeding to maintain or restore condition, instead of losing weight as often happens. Unless they have a wide range on well-spelled country, young stock usually require more than is available from pasture; when well fed they are more resistant to parasitic disease. Breeding ewes should not be allowed to suffer a period of "going back" at this time. All stock require a better maintenance diet in the winter than in the warmer weather to keep up body heat.

In the southern districts considerable reliance is placed on roots, mangolds, swedes, turnips, and sugar beet as supplementary winter feed for cattle and sheep. In many parts of the North Island chou moellier appears to be increasingly grown for that purpose. It is usually cut and carted out to cattle, but sheep may be grazed on a standing crop.

Saving the Summer Surplus

However, where better utilisation of the summer surplus of pasture is aimed at, hay or silage, or preferably both, must be made and plans laid for the successive closing of suitable areas. Good subdivision is necessary to do that effectively, and the electric fence may prove useful. If roots or chou moellier are to be fed, hay becomes a necessity. Fields Division officers will advise on methods of silage or hay making best suited to any farm or district.

Lucerne hay or material with a higher percentage of clovers, if equally well saved, is more nutritious than a pure grass hay, and early-cut hay is better than late-cut. However, a regrettable waste frequently occurs after hay—probably good hay—has been harvested because of faulty stack building or covering or failure to house or cover baled hay properly. It is doubtful if the old craft of thatching will ever take very deep root in New Zealand, but there is certainly room for an efficient substitute.

A rough guide to the amount of hay that should be on hand is one ton to each cow. The quantity fed will de-

WHEAT

Bulletin 287, "Wheat," describes the place of wheat in the rotation, the growing and harvesting of the crop, as well as the fungous diseases and insect pests of wheat.

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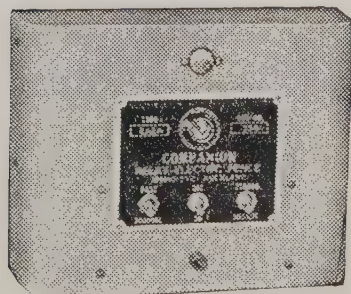
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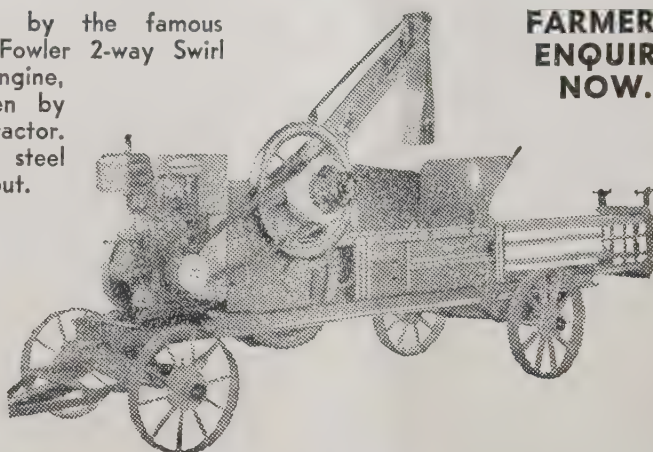
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pend on whether cows are milking or dry and what pasture or other feed is available, but may vary from 20lb. of hay alone for dry cows where little grazing is available to 12lb. of hay and 40lb. of silage, or 15lb. of hay and 40lb. of roots, for milking cows.

Where stock are fed hay in paddocks reasonable care to prevent waste is desirable. Put hay on the drier, more sheltered ground, and preferably along fence lines. Wire-netting racks are preferable for sheep.

Carrying Capacity

An increase in stocking requires to be approached with care or results may be opposite to those desired. On improving properties the number of stock carried is usually being cautiously increased season by season. On dairy farms where herds were reduced during the war years a return to pre-war levels should present no danger. An appeal has been made for the keeping of additional heifer calves, and that is within the power of all farmers who run cattle.

However, if it is intended to increase the number of stock, either cattle or sheep, above what has been accepted as normal capacity, consideration must be given to the reserves of feed available. It may be necessary to save more hay or silage, grow additional roots or other crops for winter feeding, or establish an area of lucerne. Increased stocking without such provision will be likely to lower the output.

However, long-term increased stock-carrying capacity can be achieved only by pasture improvement through topdressing and the saving of the better species and strains of pasture plants.

Losses from Disease

To effect a reduction of preventable disease losses one important principle is that full use should be made of the professional and advisory services available. Apart from those in the Government service there are in New Zealand about 50 veterinary surgeons either in private practice or with veterinary clubs and dairy companies. In the near future the latter two groups will be organised under the Veterinary Services Council, as detailed in the September issue of the "Journal." Through the Dairy, Meat, and Wool Boards farmers contribute to the funds of the council, those contributions being subsidised by the Government.

Veterinarians and Inspectors of Stock of the Livestock Division, though largely concerned with the control of certain scheduled diseases of stock, are also available to investigate and give advice on any problems of stock disease. Behind the private or club veterinarian or the livestock officer is the Animal Research

Division, whose specialist officers, as well as carrying out long-term investigations of problems such as mastitis, provide a diagnostic service on specimens and material forwarded to them and assist in solving the many local disease problems that arise. The division also supplies vaccine for conditions such as blackleg and sore mouth of sheep.

An important function of both the non-departmental veterinary surgeon and the Government officer is the giving of advice about feeding and management that will help to prevent disease. This may be done by lectures, broadcasts, articles in the "Journal of Agriculture" or newspapers, but much more effectively during visits to farms, when such problems can be discussed on the spot.

There is thus available to all farmers a reservoir of expert knowledge which should be freely used, and it is important to seek assistance early. If stock are going back in condition or dying, do not wait until the trouble has assumed serious proportions or the animals are so debilitated that recovery is problematical even with proper remedial measures.

Troubles Caused by Feeding

The following illnesses of stock are particularly related to feeding:—

Bloat caused by rapid intake of greenfeed on a comparatively empty stomach. Observations by the Fields Division suggest that unduly-heavy grazing of certain pastures in late winter and spring depresses ryegrass growth and favours excess clover. Sheep may die from bloat.

Red water in the spring before or after cows have calved, caused by excess feeding of roots or chou moellier without sufficient hay.

Impaired ovarian function and delayed conception in cows whose winter condition has been allowed to get too low. Until such animals regain condition and reach a suitable protein intake, which may not be until pasture growth is well established, heat periods may be absent.

After-calving complaints which may be reduced by better winter feeding, maintaining an even plane of nutrition, and keeping up hay supplies during the early spring flush so that the change of feed is made gradually. A sudden change, quite as much as any fault in the new feed, may upset the animal's equilibrium and cause indigestion, scouring, and other more obscure disorders.

In the Department's annual report for 1946-47 Dr. J. F. Filmer, Director of the Animal Research Division, states of one type of after-calving complaint: "The feeding of 7 to 10cwt. of good hay per milker from early June

to late September, together with the use of rationed autumn-saved pasture over the same period, provides a good foundation for calving and early lactation. A large proportion of short young pasture in the diet with only 3 or 4cwt. of hay per cow is a risky diet and, given a flush of early spring growth, one that will predispose cows to ketosis and grass staggers or the two together." That view was based on investigations in the Waikato during the spring of 1946.

Clean pastures are important for all young stock to reduce parasitic disease. The good results obtained at the Animal Research Station, Ruakura, by running calves ahead of the dairy herd are an example of what can be done.

Facial eczema can be prevented or limited by keeping stock off the dangerous pastures in their toxic stage or severely limiting the intake. That presupposes either a reserve grazing area of more matured grass or a good store of silage or hay which can be fed out.

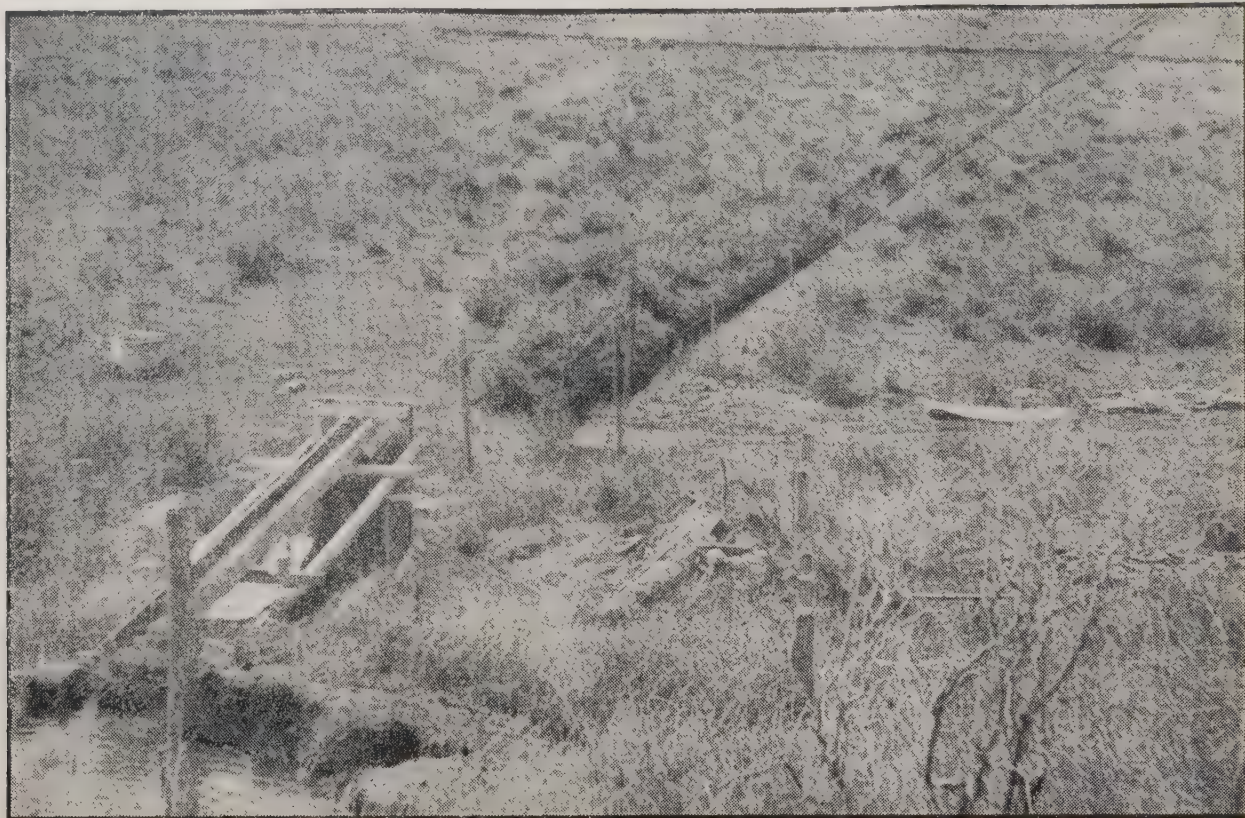
Sleepy sickness in ewes may occur after any drop in feed supply during a late stage of pregnancy. If pasture feed is insufficient, a supplement is necessary, and hay is quite suitable. It is very desirable either that some preliminary training to take hay be given before the critical period arrives, or that the flock include some sheep with previous experience of hay feeding. Sheep supplied at that time with a food to which they were unaccustomed have been known to refuse it for two or three days and precipitate the very trouble it was desired to avoid.

Vaccination Service

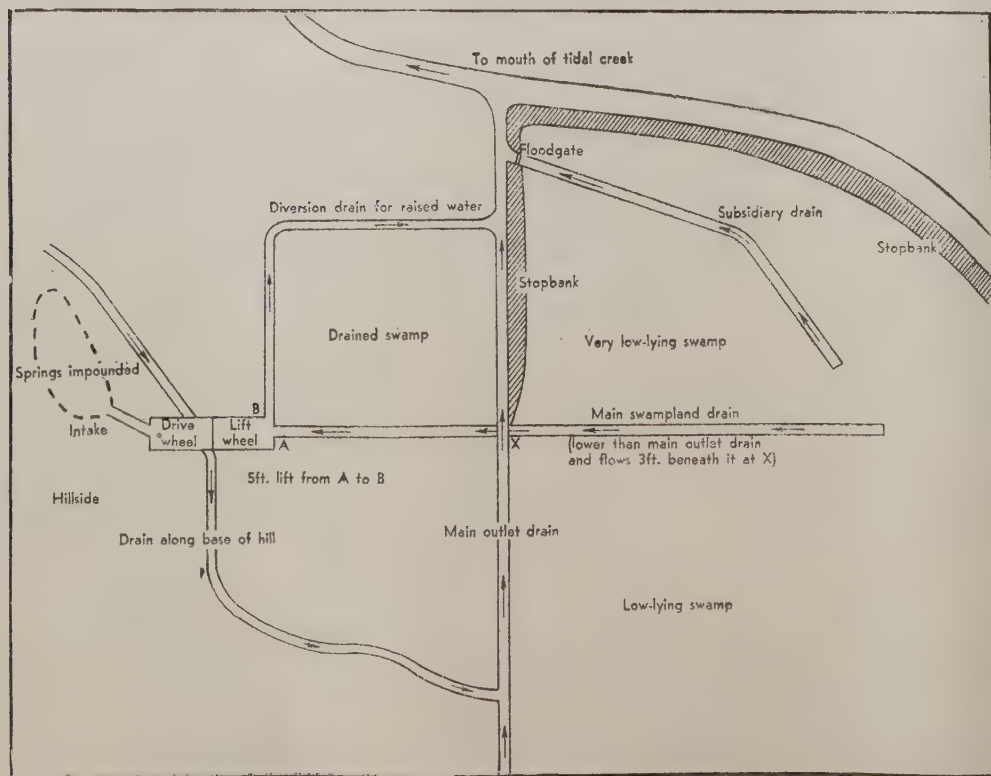
An important service now available to farmers is the vaccination of calves against contagious abortion, hitherto a cause of serious loss in both dairy and beef herds. Surprisingly, though it is now widely accepted as routine procedure, some farmers are still unaware that this vaccination can be carried out. Application before December 31 with the fee of 1s. 6d. each for up to 14 calves and 1s. 3d. thereafter, made to any veterinary club, dairy factory, departmental veterinarian, or Inspector of Stock, will ensure that calves are vaccinated. As the vaccine is now brought weekly from Australia, early application is important so that the vaccination programmes can be planned.

Other vaccines supplied by the Animal Research Division are those against blackleg both for cattle and sheep and against contagious ecthyma or scabby mouth in lambs. Many thousands of doses of scabby mouth vaccine have been issued recently, as vaccination is usually carried out at docking time.

SURPLUS WATER LIFTED



[Ronald Vine photo.]



Above — A general view of the area in the diagram on the left. Impounded spring water flows down the flume in the left foreground to the top of the drive wheel. A deep, open drain runs from the very low-lying swamp in the right background to the lift wheel, passing at right angles under the main outlet drain in the background. A single-wire electric fence emerges from the shelter on the right of the drive wheel.

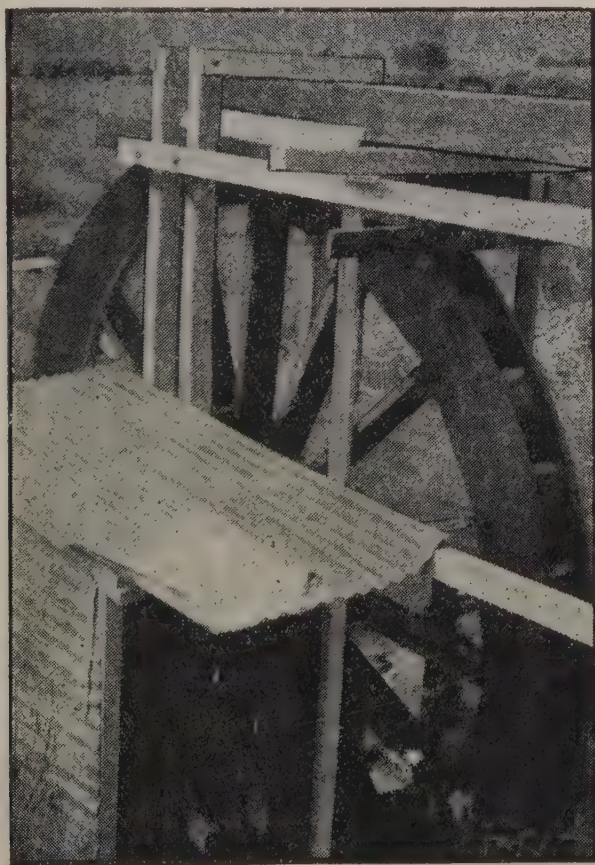
BY SURPLUS WATER

By E. R. MARRYATT, *Fields Instructor, Whakatane.*

THE problem of having a main swampland drain lower than the main outlet drain has been overcome in a novel way by Mr. R. Walker and his sons on the swamp portion of their farm at Tablelands, Opotiki, Bay of Plenty. Water from springs near the base of a hill has been made to turn a large, home-made, overshot waterwheel, driving a smaller home-made lifting wheel which raises the "problem" drainage water 5ft. from the lower end of one open drain into the upper end of another, giving plenty of fall for adequate drainage of a large area of low-lying swampland.

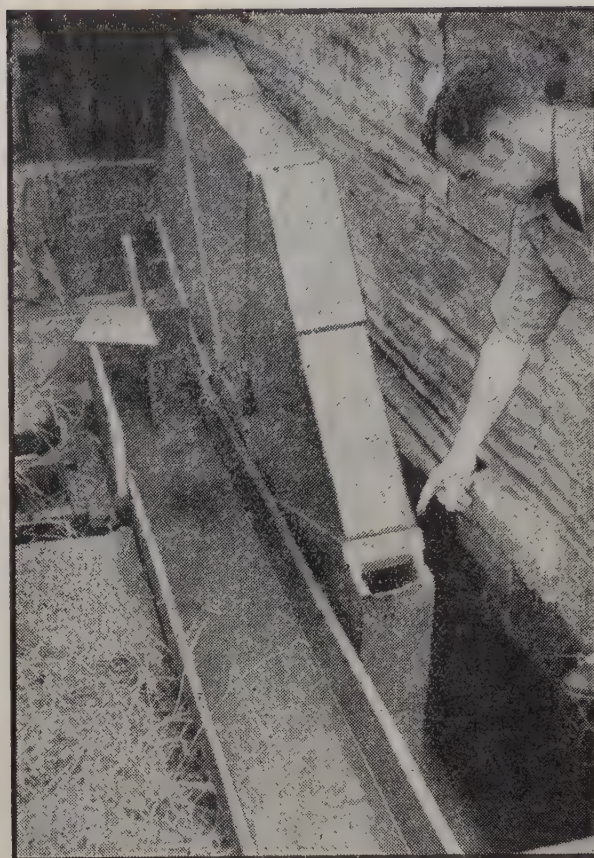
THE farmer recognises that the same result could have been obtained by using a swamp pump and an electric motor, but this is a description of an interesting way in which a farmer of an inventive turn of mind used suitable conditions to solve a certain drainage problem rather than a recommendation to others to adopt his scheme.

The cost of establishing the plant cannot be computed because it was built largely from material which was on the farm and because no records were kept of either materials used or the time and labour put into it. As the details were worked out and modified as construction proceeded, the time and labour cost was not inconsiderable.



[Ronald Vine photo.]

The drive wheel, powered by impounded spring water flowing along the flume above the wheel.



[Ronald Vine photo.]

The lift wheel. The finger indicates the opening in one of the segments of the octagonal wheel. The wheel was stopped to be photographed, but when it is in operation water flows from outlets in the wheel into the flume on the left and thence into the new drain. The bottom of the drive wheel is in the background, and the driving belt is under cover on the right.

Advantages over Pump

The plant has the advantages over the orthodox swamp pump and electric motor of being costless in operation, saving £20 a year in power charges, and not being subject to power failures and cuts. Repairs and maintenance are negligible and, perhaps as important a point as any, this machine does not require regular attention.

The driving wheel, 12ft. in diameter, can use in one revolution about 100 gallons of water, and the lifting wheel, 9ft. 6in. in diameter, will lift about 100 gallons in one revolution. The best speed of the driving wheel is about six revolutions a minute. The belt drives the lifting wheel on a 36in. pulley from a 32in. pulley on the driving wheel. The shafting is 2½in. and runs on jarrah bearings.

The drive wheel is also used to operate an improvised electric fence machine. A wheel of about 15in. diameter fitted to the end of the shafting has five "trips" bolted to it at equal intervals, and they lift and drop a lever at intervals of 1½ to 2 seconds, making and breaking contact between the points of an ignition coil connected to a six-volt car battery and to the electric fence. This machine gives a very good intermittent shock.

Efficient Method of Boiling Water for Milking Equipment

By C. L. SYMAN, *Farm Dairy Instructor, Wanganui.*

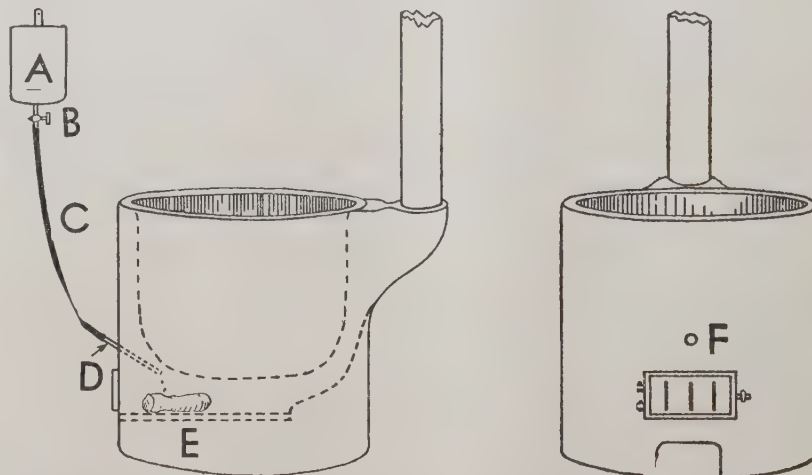
BOILING water for the cleaning and sterilising of milking shed equipment can be simply but efficiently provided by the use of a self-contained copper heated by fuel oil. The oil is fed into the copper on the gravity principle and thus obviates the continual attention required by a wood-burning copper.

THE materials needed for making the oil-feed apparatus, which are easily obtainable, are: An open-mouthed 1-gallon tin, a petrol or gas tap for soldering flush on to the bottom of the tin, 1ft. of $\frac{1}{4}$ in. or $\frac{3}{8}$ in. pipe (preferably steam pipe), a length of tubing (copper preferably, but rubber is suitable), and a length of chimney to reach well above the roof of the milking shed. The accompanying illustrations show the method of assembling the materials and how the pipe is led into the copper.

The fire is started in the normal way with paper, a few chips, and a large log. When the fire is burning well the oil is allowed to drip on to the log, which acts as a burner. The quantity of oil necessary to bring the water to the boil can be determined by trial and error, and by regulating the setting of the tap the water can be brought to the boil by the time all the oil in the tin is used. The common type of copper holds 12 gallons, but the farmer with a large plant will find it adequate for his needs if he adds cold water to the copper and allows it to reboil when he draws off a few buckets of boiling water.

A farmer supplying a cheese or casein factory can use one boiling for cleaning his milking machinery and can have another boiling ready to clean his cans by the time he returns from the factory. The time taken to boil a copper of water with oil fuel is between 15 and 20 minutes, and the quantity of oil necessary is about 1 pint, depending on the construction of the copper.

The fuel oil used in flame-throwers, which is procurable in 40-gallon drums, is recommended, as it gives a hot flame instantly. Old engine oil and crankcase oil are not recommended because they are slow burning and give off odours.



The self-contained copper with the oil-feed apparatus in position for operating. A 1-gallon tin, B small petrol or gas tap, C tubing, D $\frac{1}{4}$ in. or $\frac{3}{8}$ in. steam pipe, E log, F front view of entry hole for the steam pipe.

Change in Reserve Price Procedure at Wool Sales This Year

THE reserve price procedure for New Zealand wool has been altered this year to conform with procedure in the United Kingdom, Australia, and South Africa, according to advice received by the New Zealand Wool Board from the New Zealand Wool Disposal Commission.

From the opening wool sale for this season, held on September 25, the joint organisation reserve price valuations on wool to be offered at auction will not be handed to brokers. Where necessary the joint organisation representative at auction sales will bid the reserve prices at the sale. Through their brokers, growers may place their own reserves on any lots and, if they fail to effect a sale, they may sell such lots at the joint organisation reserve prices during the option period. In accordance with pre-war practice growers may obtain from their brokers advice about market valuations of their wool.

If a grower places his own reserve on a lot at a price higher than the j.o. reserve, and there is no bid by a commercial buyer at or in excess of the j.o. reserve, the lot is passed to the joint organisation at its reserve. Through his broker, the grower can endeavour

The small $\frac{1}{4}$ in. or $\frac{3}{8}$ in. pipe has to be cleaned with a piece of wire occasionally to remove burnt carbon at the fine end.

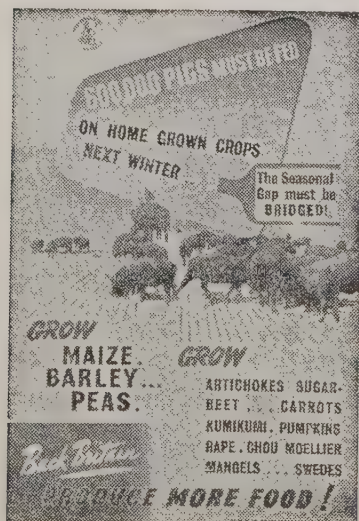
The copper should, if possible, be able to be lifted out of the housing to allow soot to be brushed off occasionally.

Care must be taken when installing a copper at the milking shed, as the Dairy Regulations do not allow a copper fired by wood or oil in the separator room. A site such as one near the separator room and under the milking shed veranda should be selected, care being taken that the prevailing wind blows the smoke and fumes away from the separator room. If a dairy farmer is in doubt of a suitable place for installing a copper, he should consult his local Farm Dairy Instructor.

to effect a sale to a commercial buyer and, if he is not successful, he can sell to the joint organisation at the j.o. reserve price during the option period from the conclusion of the sale of the last catalogue until 4 p.m. on the second day after the sale.

A further provision is that if a grower places his own reserve on a lot at a price higher than the j.o. reserve, and the price bid equals or exceeds the j.o. reserve but is less than the grower's reserve, the lot passes to the commercial buyer who made the bid and the grower then has the right to sell the lot to the joint organisation at the j.o. reserve price if he cannot effect a sale to a commercial buyer. The option period is the same.

Following is an example of the working of this provision: A grower places his own reserve of 16d. on his wool, the joint organisation's reserve is 14d., and the price bid is 15d.; if the grower does not sell to a commercial buyer at a price between 14d. and 16d., he can sell to the joint organisation at the j.o. reserve price (14d.) between the conclusion of the sale of the last catalogue and 4 p.m. on the second day after the sale.



Soil Moisture in Kerikeri Citrus Orchards

By G. M. BRUERE, *Department of Scientific and Industrial Research,*
and P. EVERETT, *Orchard Instructor, Kaikohe.*

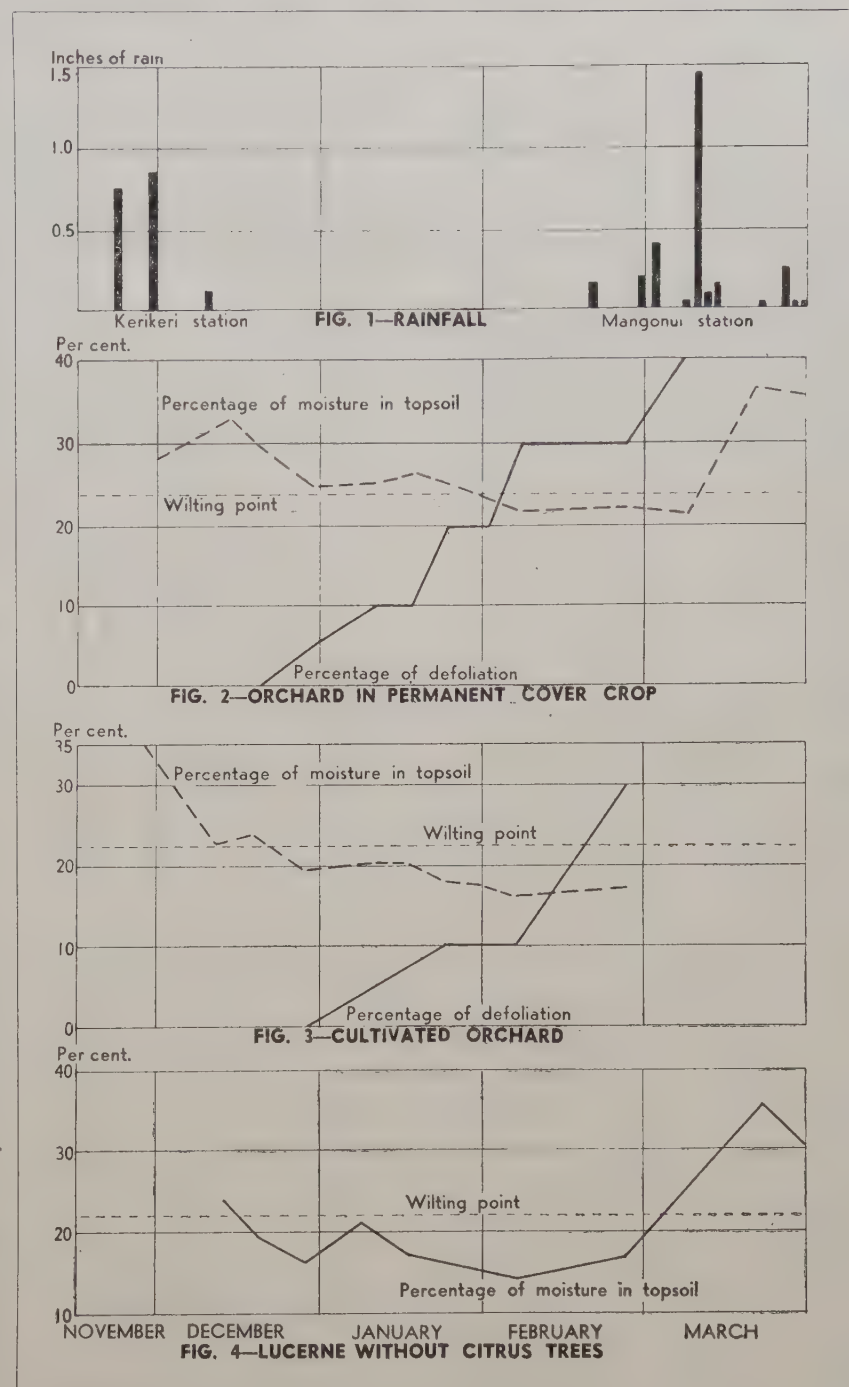
CITRUS orchardists at Kerikeri, North Auckland, where summer rainfall is low and soils in some seasons become very dry, have noted that dry summer conditions cause the trees to crop lightly. Two methods have been widely used to reduce the effect of low rainfall: Either a cover crop is grown in the winter, disced in, and the ground cultivated to a depth of a few inches so that a mulch of loose soil lies on the surface to decrease the evaporation of moisture from the soil; or a permanent pasture is grown and kept mown short, the trees being mulched with the mowings. The permanent cover crop shelters the soil from the sun and is mown short to keep transpiration loss at a minimum and the mulch reduces evaporation close to the tree.

TO throw some light on the value of these practices it was decided to measure the soil moisture of a number of orchards at regular intervals during the summer. Of the orchards chosen some were in a permanent cover crop and on others the cover crop was ploughed in before the growing season. All the orchards were on the deep-phase friable clay at Kerikeri.

Measurement of Soil Moisture

Rainfall data are recorded for the district during the year, but the water available in the soil, and not that which falls, is the important factor, as some may evaporate soon after falling.

The soil moisture is the amount of water in the soil expressed as a percentage of the dry soil. As this figure is not itself sufficient to tell whether a tree will grow normally, it must be considered with two other figures, the field capacity of the soil and the wilting point of the soil. The field capacity is the amount of water held in the soil after the excess gravitational water has drained away and the rate of downward movement of water has materially decreased. The wilting



point of a soil, which is the moisture percentage of a soil at which plants wilt, is a property of the soil and is independent of the vegetation.

At Kerikeri field capacities range from 55 to 60 per cent. and wilting points from 20 to 24 per cent. The effective soil moisture is the difference between the field capacity and the

wilting point, and thus some 32 per cent of moisture is available to plants.

Reports were made on the trees from selected orchards and samples were sent regularly in sealed bottles to the Soil Bureau of the Department of Scientific and Industrial Research for moisture determinations. In graphs drawn for each orchard soil moisture

SOIL MOISTURE IN CITRUS ORCHARDS . . .

percentages of the topsoil (0 to 6in.) and the subsoil (6 to 12in.) were plotted against the date when the samples were taken at Kerikeri. The wilting points of the soils were also measured. Knowing the wilting point and soil moisture values of a soil for a season, it was possible to see when a soil was below its wilting point and how long it was in that condition.

Results of Tests

The accompanying graphs are some of a number which were drawn for a series of orchards to show the effect on soil moisture of cultivated bare ground as compared with a permanent cover crop, and how older trees (15 years) were affected by dry conditions as compared with young trees (eight and nine years).

Fig. 2 is a graph of an orchard of eight- to nine-year-old trees with a permanent cover crop of pasture. The percentage of defoliation of the trees during the season is plotted on the graph against the date.

The rainfall data for the summer season is shown in Fig. 1. As the Kerikeri rainfall station was not kept in operation all the summer, some of the data are taken from the Mangonui station, 30 miles north-west of Kerikeri. The average rainfall for a normal year is about 60in.* The average rainfall from 1943 to 1946 was 72in., of which about 34in. fell between October 1 and March 30. The 1945-46 season was abnormally dry, as only 7in. of rain fell between October 1 and March 30.

The moisture graphs follow the rainfall data and, as would be expected, after every appreciable fall of rain the soil moisture increased.

Fig. 2 shows that the topsoil first reached its wilting point near the end of January, 1946, and from that date until March 4 the soil moisture was below the wilting point. Thus for over a month in this orchard, and for two months in some other orchards, no topsoil moisture was available to the trees. About the time the topsoil reached its wilting point serious defoliation and dropping of young fruits from the trees occurred. This orchard was under a permanent cover crop of pasture which was sown in October, 1944, and was mown and used as a mulch around the trees about November 1, 1945.

Fig. 3 is a graph of an orchard of eight- to nine-year-old trees which was cultivated during the growing season. The graph shows that the topsoil of this orchard reached its wilting point near the end of December, about a month before the orchard referred to in Fig. 2. Fig. 4 shows how the topsoil moisture of an area under lucerne

without trees varied during the summer; the topsoil reached its wilting point in mid-December.

Conclusions

Following are the general conclusions from all experiments:—

1. The 15-year-old trees showed the effects of dryness under any one system of orchard practice to a greater extent by defoliation and dropping of young fruits than did the eight- to nine-year-old trees, though the soil moisture was similar.
2. On the dates when the topsoils reached their wilting points the young orchards under permanent cover crop showed greater defoliation than did those that were cultivated. That suggests that the trees in orchards under cultivation

were making more use of the subsoil moisture, which, as with the cover-cropped soils, was above the wilting point throughout the season for all orchards.

3. In these young orchards, however, the topsoils under permanent cover crop did not reach their wilting points as quickly as did the topsoils which were cultivated.
4. In the older orchards the soils reached their wilting points about the same date and the amount of defoliation was the same for all the older trees. A more rigid experiment is needed to evaluate the difference, if any, between permanent cover crop and cultivation for the older orchards.
5. The soil moisture graph for an area under lucerne without trees is very similar to the graphs of the other orchards. That suggests that the trees themselves do not exert any unusual drain on the soil moisture.

CERTIFIED GRASS AND CLOVER SEEDS New Minimum Purity Standards

GOVERNMENT Certification of grass and clover seeds relates to the type or strain of the seed Certified, but provides no assurance of either the purity or the germination of the seed. Instead every line of Certified seed is sampled by an officer of the Department of Agriculture, and is submitted to the Seed-testing Station for analysis of purity and germination.

The certificate of analysis covering this examination shows the germination and the purity of the seed and also the nature of the impurities. It can be identified with the line of seed from which the sample it represents was drawn, as the registered numbers appearing on the Certification tags attached to the sacks of seed are repeated on the certificate itself.

Intending purchasers of Certified seed are urged to inspect the relative purity and germination certificate before completing their purchase in

order to assure themselves that the seed contains no weed seeds which would prove harmful on their farm and that the price placed on the seed is in conformity with the germination percentage.

Before grass or clover seed is finally tagged and sealed as Certified it must comply with certain minimum standards of purity as an assurance that reasonable machine dressing of the seed has been undertaken. The present standards were recently revised and the new ones, which are set out below, will come into operation on January 1, 1948.

It must be stressed, however, that these are minimum standards only and that seed complying with these standards might easily contain harmful or noxious weed seeds. Only by perusal of the purity and germination certificate can the farmer assure himself on this point.

Variety of seed	Minimum purity per cent.	Additional conditions
Perennial ryegrass (all classes) ..	97	With not more than 2 per cent. of weed seeds
Italian ryegrass (all classes) ..	98	
Short-rotation ryegrass (all classes) ..	98	
Cocksfoot (Government Stock seed) ..	70	With not more than 3 per cent. of weed seeds, not more than 3 per cent. of other crop seeds, and not more than a trace of ryegrass
Cocksfoot (Pedigree seed) ..	70	With not more than 3 per cent. of weed seeds, not more than 3 per cent. of other crop seeds, and not more than 0.5 per cent. of ryegrass
Cocksfoot (Mother and Permanent Pasture seed) ..	70	With not more than 3 per cent. of weed seeds, and not more than 3 per cent. of other crop seeds
Browntop ..	97	With not more than 1 per cent. of weed seeds With not more than 1 per cent. of weed seeds
Montgomery red clover (all classes) ..	96	
Cowgrass (all classes) ..	96	
White clover (all classes) ..	90	With not more than 2 per cent. of weed seeds and 2 per cent. of other crop seeds (suckling clover excepted)

*Kidson, Meteorological Office Note No. 17, 1937, P. 22.

NEW ZEALAND'S POTATO CROP



By C. C. LEITCH, Assistant Fields Superintendent, Christchurch.

THE potato has always been an important crop in New Zealand agriculture. There have been occasions when it has been necessary to supplement production with importations from other countries, but in most years the quantity grown has been sufficient to meet all demands. The area planted in recent years has averaged about 21,000 acres annually, and the gross value of the industry to the grower is about £700,000 a year.

IN the pioneering days the potato was one of the main items of food, and it has continued to be an important food in most households in the Dominion. The crop is adaptable to most soil types, and nearly every household with any land available has at least a small patch of early potatoes for the off season.

The areas grown for commercial purposes have fluctuated between 16,000 and 30,000 acres with an average of about 21,000 acres and an average yield of 110,000 to 115,000 tons. Percentages of the Dominion acreage grown in various districts in a recent year were: North Auckland 7, Auckland 4, Gisborne 1, Hawke's Bay 4, Taranaki 1, Wellington 14, Marlborough 1, Nelson 3, Canterbury 52, Otago 8, Southland 5. Canterbury Province produces the bulk of the table potatoes as well as being one of the main sources of supply for seed.

The crop is grown on a wide range of soil types from heavy, sandy, silt loams to heavy clay loams. The heaviest cropping areas are the heavy, well-drained, silt loams. In the selection of the area, drainage is probably the most important factor to be considered.

By selection and the introduction of new varieties, a stage has been reached where it is now possible to obtain suitable varieties for most soil types. The choice of suitable varieties has made potato growing a profitable venture on soil which was previously considered unsuitable. For example,

Northern Star, though unsuitable for most potato-growing areas, is the one variety that has found a very important place in the Pukekohe area of the North Island. Similarly, the Arran Chief has proved its worth particularly to the Willowbridge-Studholme growers of South Canterbury, and the selection Aucklander Short Top has proved admirably suited to conditions in Canterbury Province generally.

Varieties

A multitude of varieties has been imported, and the following are the more important ones being grown today:—

Aucklander Short Top

This variety, a selection from Suttons Supreme, is the most popular potato grown today, no doubt because of its moderate earliness, good yield, and excellent quality. It is suitable for growing on the medium to lighter soils of both islands. Very often it is used as an early potato in home gardens. It has a very thin skin and is easily bruised, so care is required in handling to avoid damage. Under average conditions it produces a large proportion of table potatoes. The tubers are inclined to be coarse and "knobby" when grown on very heavy soils. It is susceptible to leaf roll.

Aucklander Tall Top

The Aucklander Tall Top, another selection from Suttons Supreme, is

three weeks to a month later than the Short Top. The tubers are inclined to be coarse in shape under average conditions, but when grown on lighter potato soils the variety usually produces well-shaped tubers. The lateness in maturity, resulting in the crop being dug before it is properly ripe, is probably the main cause of tuber damage. It is a good variety for the lighter land. Its quality is equal to that of the Short Top, and Tall Top is a heavier yielder. It is susceptible to leaf roll and wilt disease.

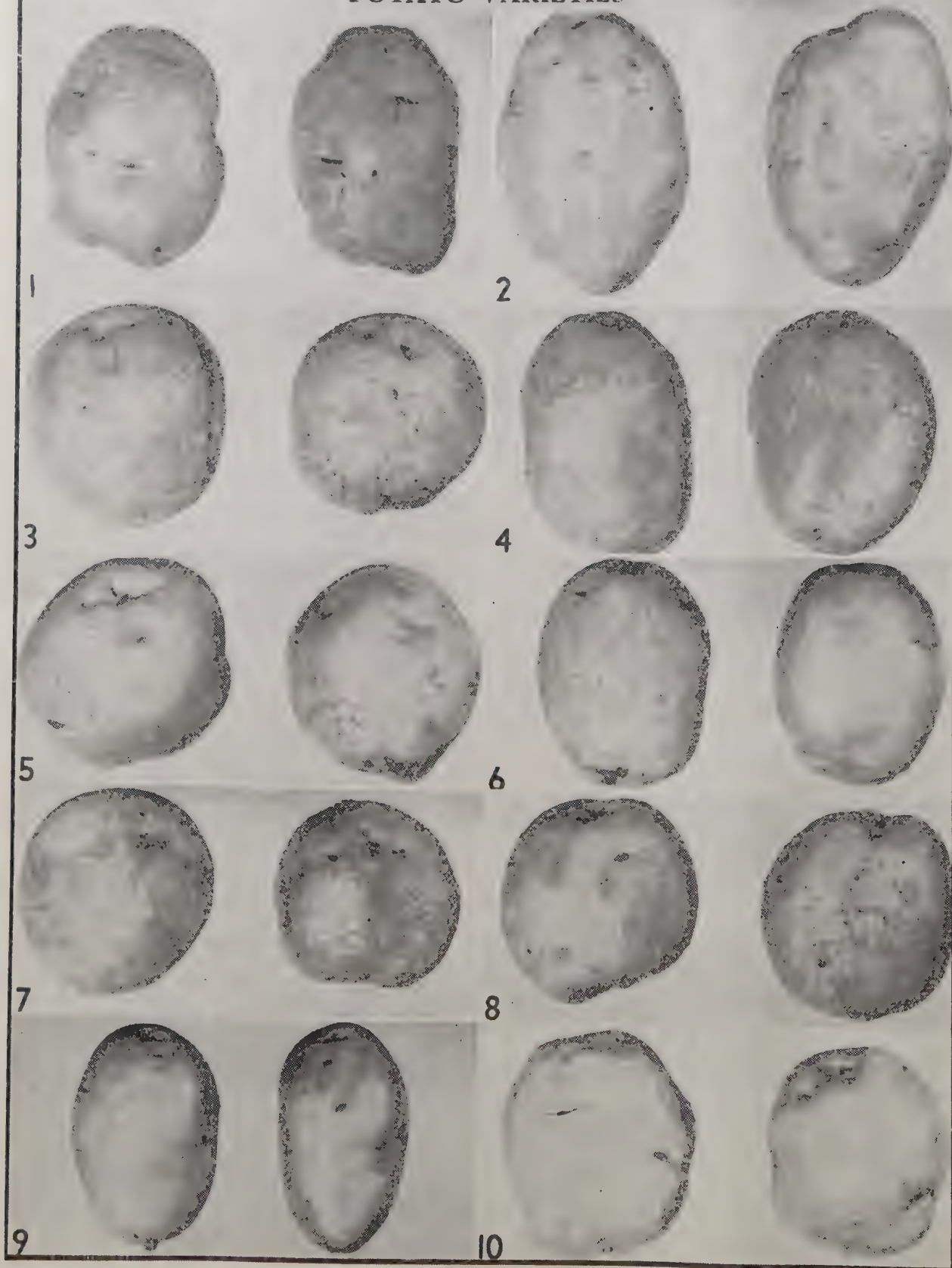
Arran Chief

The Arran Chief variety has been on the market for a number of years and is very popular on the medium to heavy potato land. It is a heavy yielder of well-shaped tubers, which stand up to transport conditions very well. It is susceptible to late blight but is not prone to second growth, as after a check it produces fresh tubers when growth starts again. It is grown extensively in the Willowbridge-Studholme district of South Canterbury and the southern areas of the South Island. It is subject to both mosaic and leaf roll. The Northern Star variety is a common impurity in the crop and is difficult to detect.

Inverness Favourite

A recent introduction, and very suitable for heavy, well-drained soils, Inverness Favourite produces plenty of foliage and thus forms a good cover, suppressing weed growth. It is a main crop of good quality, but is susceptible to late blight and inclined to second growth in a catchy season. It is better suited to heavy than lighter soils, on which it produces rather many small tubers. The tubers are a good shape. It is prone to both leaf roll and mosaic.

POTATO VARIETIES



POTATO VARIETIES GROWN IN NEW ZEALAND



Potato varieties illustrated on opposite page—1 Dakota, 2 Aucklander Tall Top, 3 Iron Duke, 4 Inverness Favourite, 5 Arran Banner, 6 Up-to-Date, 7 Arran Chief, 8 Northern Star, 9 Jersey Bennes, 10 Epicure. Above—11 Aucklander Short Top, 12 King Edward.

King Edward

Sometimes called Fellside Hero, King Edward is a very popular variety with growers in the southern part of the South Island. It prefers a cool climate and in such conditions is a good cropper, but in districts subject to dry periods it is a disappointing variety. The tuber is parti-coloured, white splashed with pink, well shaped, and of good quality. The King Edward is very popular in the home garden, but is liable to attack by late blight. It is an early main crop, and is subject to leaf roll and mosaic.

Dakota

A very popular variety in Mid-Canterbury and parts of North Canterbury, the Dakota is not grown extensively elsewhere, as it does best on a sharp silt loam. It is a good cropper, and the only popular coloured main-crop potato grown in New Zealand. It is red in colour, a good keeper of excellent quality, but deeper in the eye than most varieties and therefore more wasteful for the housewife. It is a very useful variety for late in the season. It is subject to late blight, mosaic, and leaf roll.

Iron Duke

A heavy cropper which does well on heavy potato land, Iron Duke is of fair to good quality and reasonably resistant to late blight. It is grown mainly in North Canterbury and parts of Wellington Province. It is subject to mosaic and leaf roll, and deteriorates very rapidly when infected with the latter.

Northern Star

Sometimes known as Britain's Best or Gamekeeper, Northern Star is a late main crop which in the opinion of consumers generally is of indifferent quality. The tuber is round and smooth with a deep pink eye. The greatest objection to it on any but the heaviest of potato land is the large number of small tubers produced, sometimes strung together. It is a very common rogue in other white-skinned varieties. It is not grown very extensively in the South Island now, but is the main variety in the Pukekohe district of the North Island. Virus disease, mainly mosaic, is found in the crop.

Majestic

Though an early main crop of good shape and quality and moderate to good yield, Majestic is not grown extensively. It is a good home garden variety but very liable to damage by bruising. Poor stands often follow the planting of cut tubers. Majestic is subject to leaf roll, which when present to an appreciable degree reduces yields considerably.

Up-to-Date

A very old variety, Up-to-Date is still considered one of the best main-crop potatoes ever grown. It is an excellent cropper of good shape and quality. Unfortunately, it is very susceptible to late blight and deteriorates very rapidly with virus disease, both leaf roll and mosaic. It is, therefore, not as extensively grown as its quality warrants. Up-to-Date is a good variety for the home garden if Certified seed is available.

Epicure

Because of its good cropping and hardiness, Epicure is still the most important early potato grown in New Zealand. It can be grown on most medium to light soils, but its greatest

use is for the home garden, where it is grown for its earliness. Under good conditions this variety will mature in 10 weeks. The tuber is round, rather deep in the eye, and develops a faint pink tinge in the skin after being dug. When left to mature it sometimes develops brown fleck. It is subject to mosaic and sometimes leaf roll.

Arran Banner

An early main crop, Arran Banner is increasing in popularity for use on medium to light soils. When grown on heavy land it produces large rough tubers which frequently develop hollow heart. It is a heavy cropper of medium to good quality. It is being increasingly used as an early variety because its yield is heavy and the tubers are produced early in the growing period and cook well even when used immature. It is subject to both mosaic and leaf roll.

Jersey Bennes

The Jersey Bennes variety has been grown in the southern part of the South Island and to a less extent in northern districts. It resembles the King Edward in that it does best in a cool climate and sheltered situation. It is classed as a first early of excellent shape and good yield. It is subject to late blight and virus disease, mainly mosaic.

Older Varieties

Some of the older varieties like Bresee's Prolific, Early Regent, and Early Regent Bolter were grown to some extent 10 to 15 years ago, but they have gradually been replaced by the more popular variety Aucklander Short Top. Some of these old varieties had some features which made them popular in their day, but their susceptibility to virus disease and the constant work required to keep them approaching reasonable cropping power have militated against

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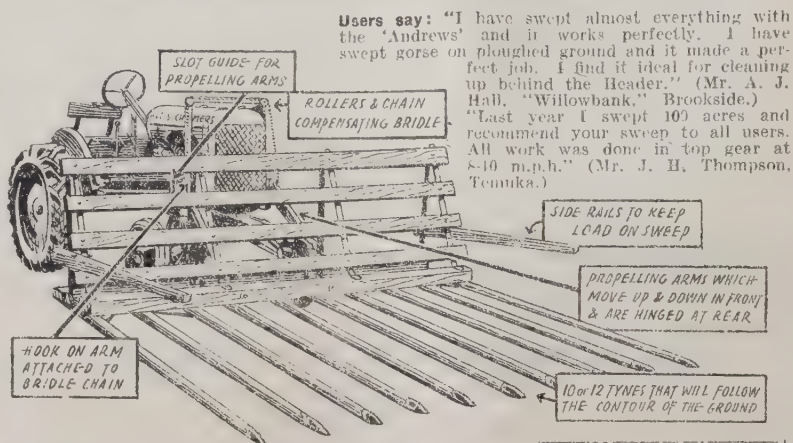
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their revival. Probably only sufficient of these varieties are grown today to meet the requirements of the home gardener.

Recent Introductions

There have been recent introductions from the United Kingdom and America. Of these Katahdin, Dunbar Standard, Doon Early, and Chippewa are the ones showing most promise, though other newer varieties are also under trial.

Development of Industry

The growing of the potato crop has developed along two main lines:—

1. Those who make the crop one of the main sources of income are to be found on the good potato land. These growers each plant fairly substantial areas annually, and are responsible for a large proportion of the commercial table potatoes produced.

2. Growers on the medium to lighter potato land at times use the crop as a side-line. From these growers comes the bulk of the seed, because at times the growing of Certified seed is more suited to their conditions. In these instances they do, of course, get reasonable yields, but the spread of disease is not so rapid and experience has proved that seed from these areas, when grown on heavy land, yields well. When the potato certification scheme was introduced, samples of seed from these areas showed that the percentage of disease was relatively small in comparison with samples from the heavier type of potato land.

Place in Rotation

The potato will fit in practically anywhere in the crop rotation. It can be grown after grass, wheat, oats, barley, peas, rape, or greenfeed. It can be used as a cleaning crop for ground infested with creeping fog and old man twitch or couch grass. Generally, however, it is sown after grass as a preparatory crop to wheat.

Preparation of Seed-bed

Like all other farm crops, potatoes respond to good preparation of the soil. That means that the work must be started early to get the most benefit from the weather. Deep and thorough cultivation is necessary for good crops.

A start is made by either skim ploughing or hustling the area. Both methods have the same objective—the working of the top 2 to 3 in. until the surface is well broken up. The work is best done in the early autumn, when enough time can be given for this working to mellow before being deep ploughed. The deep ploughing should be done to a depth of 7 to 8 in. if the topsoil will allow, or to a depth where odd pieces of clay show up. If possible, the deep ploughing should be done not later than June to allow the winter rains and frosts to play their part.

PLANTING THE POTATO CROP



[Green and Hahn Ltd. photo.]

Planting potatoes with a two-row mechanical planter.

In August or September a start should be made on the final preparation. If good winter weather has been experienced and the ground is well broken up by frosts, hustling and drag harrowing once or twice may be sufficient. The objective is to mix the turf thoroughly with the soil from top to bottom of the ploughing, at the same time endeavouring not to get the area too fine. If the winter has been wet, it may be found best to replough, but not to the same depth as before the winter.

The final preparation will depend on the methods to be used for planting. If the seed is to be planted by hand and a ridging plough used, rolling the area beforehand will be found an advantage. When mechanical planters are used rolling is not always necessary.

There are obvious exceptions to these rules, such as after cereal or pea crops, when it may be found best to deep plough first, but in any case early ploughing is essential for good results.

Planting the Seed

Planting of commercial areas is begun from September onward, depending on the locality, the main factor being liability to early frosts. In the main, in localities where late frosts are not general planting is started about the last week in September. Experience has proved that to be the best time as it enables the plant to get well established, and even though dry conditions are experienced later the crop has made sufficient growth to withstand such a setback. However, no hard and fast rule can be laid down; frost and weather are the factors governing the time of planting. The planting period can be extended over 6 to 7 weeks.

The quantity of seed necessary to plant an acre varies with the average

weight of the tubers. An approximate method of arriving at the quantity required is to allow 7cwt. for tubers that average 1oz. in weight, 14cwt. for 2oz. and so on. The width between the rows should be 28 to 31 in. and the depth from 3 to 6 in., the general practice being 30 in. with a depth of 4 to 5 in. for 2 to 4oz. seed. The distance between the sets varies with size and variety; it may be from 12 to 18 in. but the average is 15 in. for 2 to 4oz. seed.

Planting may be done by hand or with mechanical planters. For hand planting the area may be ridged with a ridging plough, the potatoes and manure hand sown, and the ridges split to cover the sets. Alternatively a three-furrow plough with manure box attached may be used and the potatoes planted in the furrow away from the feet of the horses or the wheels of the tractor. Mechanical planters of the one- or two-row types are used by most commercial growers. They can be used for varying sizes of seed and quantities of manure, with good adjustment of depth.

Care after Planting

After the crop has been planted, the area may be ridged up immediately or left in the ridge made by the planter. Some growers prefer immediate ridging, as the ground is still quite free and the sets are less liable to become waterlogged if much rain falls after planting. However, each method has its good points.

The ground should be kept as friable as possible, and if a planter or ridge plough is used, it is possible to work between the rows before the shoots emerge. Usually about 10 to 14 days after planting the area can be harrowed, using ordinary tine harrows that have been worn down. Harrowing is done in the direction of the rows

CULTIVATING THE POTATO CROP . . .

to break down the ridges made by the planter; this harrowing can be done several times if necessary to keep weed growth to a minimum. The harrow may also be used across the rows if weed growth is bad, or the area may be scuffed between the rows, getting as close to the sets as possible, and then hand hoed between the sets.

The weather and the growth of the crop will govern the amount of inter-row work necessary. After the potatoes are through the ground they make fairly rapid growth and the work must be done before the top growth prevents the machine or horses from passing down the rows. During dry weather fairly frequent working will help the crop by preventing the loss of moisture.

The crop can be moulded at any time after the tops have finished their main growth and before flowering begins. With varieties such as Arran Chief and Inverness Favourite it is best to mould when the tops are three-quarters grown. Moulding after a shower of rain is preferable but not always possible as the moulding must not be left too late. A steep, pointed mould should be put up in areas where there is a danger of late blight, and no tubers should be left uncovered to be later greened and exposed to attack by potato moth.

After moulding the area may require no further attention until the crop is ready to dig, but very often the crop is hand weeded after moulding to remove fat-hen and wild oats missed in the previous working.

Manuring Methods

Experiments carried out over a number of years have proved that the use of artificial fertiliser is advantageous to the crop. As a result of these trials

the following recommendations can be made:—

1. On the lighter and medium-class potato soils, use 3 to 4cwt. an acre of a mixture of 3 parts of superphosphate and 1 part of sulphate of ammonia; on rich, sandy-silty loams, use 5 to 6cwt. an acre of a mixture of 5 parts of superphosphate and 1 part of sulphate of ammonia.

2. In certain localities sulphate of potash may be added to the mixture at the rate of 1cwt. to the acre along with superphosphate and sulphate of ammonia.

The manure is best applied with the seed. A planter is equipped with a manure box with means of adjustment for quantity. If the manure is to be applied by hand it should be spread along the row in a strip 3 to 4in. wide; this method gives better results than broadcasting beforehand.

If a green manure crop like lupins, oats, or barley has been grown, it should be ploughed in at least 6 weeks before the crop is planted. That allows decomposition to take place without affecting the seed.

Importance of Good Seed

The seed is the most important item in the growing of a successful crop of potatoes. The soil can be the best in the country, the right quantity of manure can be used, and all other work can be perfect, but unless the best seed is sown the crop can be a miserable failure. It is therefore necessary that the best seed available be bought.

The grower today is in the fortunate position of being able to obtain seed of high quality through the certification scheme inaugurated by the Department of Agriculture some 15 years ago. Under this scheme there are two major grades, Mother seed and Commercial seed. Groups within these

grades further subdivide the crops according to the percentage of virus disease present.

Certified Mother seed is the higher class and is more suitable if seed is to be saved from the resultant crop. Group 1 is the highest, consisting of the crops most free from virus disease.

Certified Commercial seed consists of crops with rather more virus disease, but this seed is capable of producing a profitable crop of table potatoes when grown under normal conditions of soil and climate.

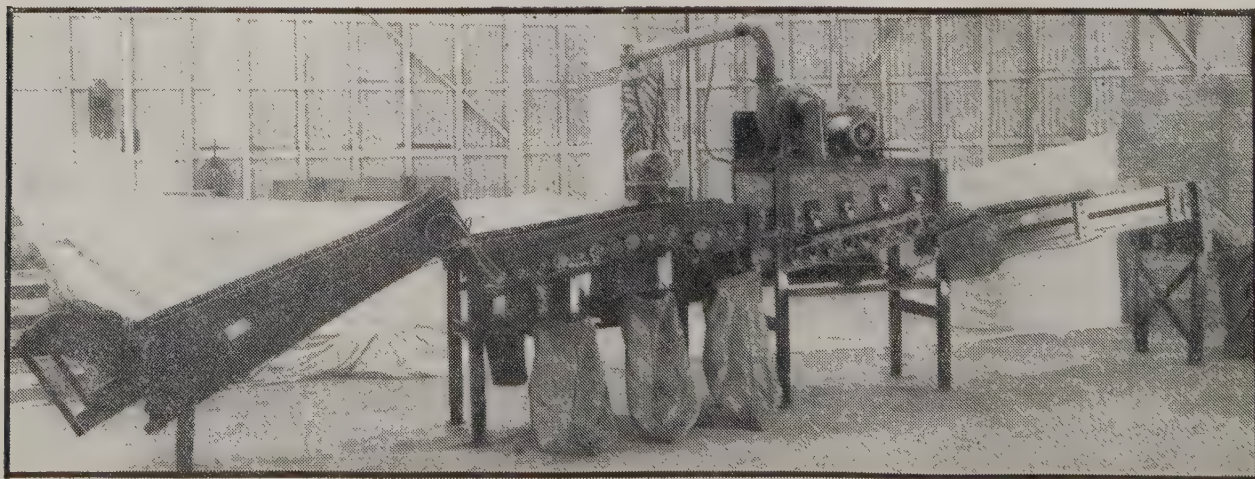
Both classes of seed can be bought in grades of various sizes, with a restriction in range between the smallest and largest tubers in any grade. That gives the buyer a fairly wide range from which to choose. Except for special purposes, the average sizes of seed in demand are contained in grades ranging from 2 to 3½oz. and from 3½ to 5oz. in size; recently the sowing of Mother seed ranging from 1 to 2oz. has been increasing.

Care of Seed

Even the best seed will deteriorate very rapidly unless stored under good conditions. The ideal method is to store the potatoes in a shed away from direct sunlight and spread not too thickly on a grating. If that is not possible, store them in small sacks spaced so that air can circulate freely. If neither of these methods is possible, stacking not more than one bag high and removing them to the paddock about a month before planting, with frequent turning of the bags, will prevent excessive sprouting.

For best results seed should be reasonably firm when planted, and excessive sprouting should be avoided at all cost.

In districts where the spread of virus diseases is not rapid, an effective method for their control is to rogue the crop during the growing period. At that stage the virus diseases show



A modern potato grader with rubber-covered rollers.

[Green and Hahn Ltd. photo.]

THE NEW ZEALAND POTATO CROP



Many hundreds of tons of potatoes stored on the farm in clamps made of straw, which protect the potatoes from the effects of the weather.

their symptoms in the foliage, and with training it is possible to identify infected plants. At that period it is also possible to differentiate between the varieties, so that if any mixing has taken place, or there are impurities in the line, they can be removed.

Certain growers in favoured localities have become specialists in the growing of Certified seed, and they spare no effort to keep their lines of potatoes up to the highest standard. To the ordinary grower that is hardly worth while, especially if he has a reasonably large area. A practice which has become popular is that of buying annually a limited quantity of the best seed and retaining the whole of the produce for planting the main area in the following season. Production is thus maintained without a great deal of rogueing. That practice has become common in the Willowbridge area, where all the large areas have what might be termed their seed plots, for which the seed is obtained from a grower in the Southland district each year. Instead of having to buy enough seed for 30 acres, 5 tons a year keeps up a supply of good-quality seed to plant out the 30 acres.

The same practice is carried out in other districts. The Darfield-Sheffield district of North Canterbury grows good seed of the Auckland Short Top variety and supplies South Canterbury, Mid-Canterbury, and the heavier potato land in Ellesmere and the North Island.

Virus Diseases

Diseases of potatoes can be divided into two groups: Those affecting the plant during the growing period, and those affecting the tubers after they have been dug.

The first can have a very serious effect on the yield of the crop. They belong to a group of diseases known as "virus," of which there are many different kinds. Where one or more

of them is found in any quantity they are chiefly responsible for low yields.

Leaf Roll

In severe cases the leaf roll virus is distinguished by the stunted appearance of the plant. The lower leaves are rigid, the leaflets thickened, harsh, and rolled upward and inward, making the leaf funnel- or spoon-shaped. The affected leaves are crisp, dry, and harsh to the touch. Leaf roll is always indicated by the rolling of the lower leaves, and should not be confused with the rolling of the upper leaves, which is usually caused by a stem or root injury. When severely infected a plant rarely produces table-size tubers. Aphides distribute the disease from plant to plant in the field, and tubers from infected plants carry the disease from one season to the next.

Mosaic

In the mild form of mosaic the leaves, instead of being uniformly green, are mottled with pale green patches. This condition is recognised more easily if the plant is shaded from the direct rays of the sun. In severe cases the foliage becomes paler, the growth more open, and the leaves wrinkled and reduced in size. The whole plant is dwarfed and the yield considerably reduced. In the mild form mosaic is difficult to detect in hot, sunny weather. Infection is carried in the same manner as leaf roll.

Crinkle

Crinkle is a form of severe mosaic. An affected plant is very much dwarfed and the leaves are very crinkled. The disease can be detected almost as soon as the plant is through the ground, the leaves being very much mottled and curled downward.

The lower leaves often turn brown and drop off and the plant matures very early, with a very low yield as a consequence.

Stipple Streak

Dark angular spots which spread down the veins of the leaf and extend to the mid-rib are the characteristic symptoms of stipple streak. In advanced cases the leaves drop off and leave only a tuft at the top, giving the plant a palm-like appearance. The yield from infected plants is very poor.

Spindle Sprout

Tubers which develop very thin, weak sprouts should be discarded, as plants grown from such tubers rarely produce any crop.

Other Diseases

Other diseases which affect the tubers, but not necessarily the yield, are ordinary scab, powdery scab, and eelworm. These diseases are troublesome mainly from the point of view of marketing, because very often potatoes which are severely affected with scab are of excellent quality when peeled and cooked.

Ordinary and Powdery Scab

Ordinary scab and powdery scab are generally found on potatoes grown in ground very rich in humus and where liming has been heavy.

Eelworm

Eelworm, found in light sandy soils, can usually be distinguished from scab by large numbers of small eruptions on the skin which when cut are inclined to be watery. One means of preventing its development is to plant potatoes after a crop of turnips or swedes. Though not completely effective, this method produces a reasonable number of uninfected tubers.

Late Blight

Late blight is rather erratic in its outbreak. It is confined mainly to areas of rather high rainfall and humid conditions, but no area in New Zealand can be said to be absolutely free from attack. Even in Canterbury

THE NEW ZEALAND POTATO CROP



Potato certification trials conducted by the Department of Agriculture, showing blocks of different varieties.

severe outbreaks have caused serious losses.

Late blight usually appears about midsummer and is sudden in its attack, 1 to 2 days under humid conditions being long enough for it to blacken off the crop. The dense growth of foliage of some varieties makes them very susceptible to infection. The symptoms first observed are blackened patches on the leaves, which become limp. The disease then extends to the whole plant, and the stem blackens off and starts to decay. The spores are deposited on the ground and, if the crop has not been well moulded, can be washed down to the tubers to set up infection there. The tubers then either rot away or are so badly damaged that they are unfit for consumption.

Fortunately the disease can be prevented by spraying with Bordeaux mixture, but the spraying must be done before the disease attacks. In some areas it is advisable to spray more than once. To prevent the disease spreading to the tubers, the tops may be cut off and removed from the area. That may mean a reduction in yield, which, however, is better than a complete failure.

Dry Rot

A storage disease belonging to the *fusarium* group of fungi, dry rot spores are found in most soils. Damage or bruising of the skin of the tuber during digging allows the spores entrance to the flesh. Under suitable conditions they multiply rapidly, and 10 days to a fortnight after digging the disease may be quite apparent. It is distinguished by a scar on the tuber, the diseased tissue underneath being much bigger than the scar would indicate. The rotted material is dry and floury in appearance.

This rot is responsible for the greatest loss to tubers after they have been dug, and is more prevalent in thin-skinned varieties like Aucklander Short Top, Majestic, and Dakota. The only method of control is to ensure

that the crop is dug when fully mature and with as little damage to the tubers as possible.

Potato Moth

Attacking the tubers after the crop has died down, the potato moth can cause serious damage in some seasons. On exposed tubers it lays its eggs, which hatch into grubs which feed off the potato. Tubers picked up at digging time which contain grubs or even unhatched eggs can cause a whole line to become damaged and unfit for use. Thorough moulding of the crop is the best preventive.

Digging the Crop

The main crop is usually dug from the end of March onward, depending on the locality. It can be done by hand or with a mechanical digger, but in these days of mechanisation hand digging has become a lost art, and the man who can dig and pick 20 to 30 bags of potatoes a day would be very difficult to find. The mechanical digger can be used with horses or a tractor, and of recent years there have been developments along the lines of power-driven diggers and even double-row power diggers.

In lifting the crop, whether by hand or by mechanical means, the greatest care is necessary if damage and loss are to be avoided. The mechanism of the digger will damage the tubers if care is not exercised in its operation.

The main point of damage is against the steel apron of the machine, which is agitated by sprocketed wheels causing an up-and-down movement to free the earth from the potatoes.

All machines are capable of adjustment to suit the conditions. On good free soil the agitation of the apron need not be as severe as in a heavier soil. The digger is operating well if the soil has disappeared by the time the tubers reach the middle of the second apron.

Correct depth of digging is also important. It should be only deep enough to clear the tubers and deliver sufficient soil to act as a cushion to

prevent them from being bruised on the apron of the digger.

The digger delivers the tubers to the ground, where they are picked and bagged. Two methods can be used: Picking in two samples, table and seed, the tables being sent for shipment and the seed pitted; or picking up in one sample and grading later. Both methods have good points, and it will be found that their use varies from one district to another.

Storage

Potatoes can be stored in one of several ways, but most growers store them in bags or in a pit. Of recent years most potatoes have been stored in bags either in a shed or stacked in the field.

However they are stored, care must be taken that the potatoes are handled carefully, have plenty of ventilation, and are kept thoroughly dry. Ample covering is very important in areas where there is likelihood of severe frosts, which can play havoc with stored potatoes.

Grading

Potatoes are usually graded during the winter, either by hand or by a mechanical grader. Today the bulk of the grading is done mechanically, only growers of small quantities grading by hand.

The grader can be driven by motor or by hand, and by the use of different meshed riddles the tubers are sorted into sizes. Several men are required to operate the grader, removing all badly-damaged, cut, and misshapen tubers as they travel over the grader. If the seed is not to be sold, it is then bagged and stored until planting time.

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- "Market Diseases of Fruits and Vegetables, Potatoes," by George K. K. Link and Glen B. Ramsay.
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High-quality Eggs Should be Aim of Producer

THERE are few items of food in more demand daily than eggs and fewer still where bad quality is more apparent. In this article W. L. McIver, Poultry Instructor, Dunedin, discusses the reasons why high-quality eggs should be produced and the steps producers can take to ensure that egg quality is maintained at a satisfactory standard.

TOO many producers think of high-quality eggs in terms of washing them clean, grading them into the relative standards by "candling" and weights, and packing them in suitable containers.

In most parts of New Zealand eggs are distributed through egg floors and little if any attention is paid by the farmer to catering for the luxury trade, as is done overseas by packing eggs in special cartons or baskets holding one (or more) dozen each for those customers who are prepared to pay more for attractiveness. The New Zealand system has the following advantages:—

1. Candling and grading are done more quickly and efficiently with better machines at egg floors.

2. The producer has an established market and does not have to find extra customers during the flush laying season.

However, the system has the disadvantage that it tends to make the producer forget his public and to lose sight of quality.

Producing Clean Eggs

When the supply of eggs does catch up with the demand the farmer who supplies dirty eggs or even improperly-washed eggs may find himself penal-

ised or the cause of restrictive regulations being brought into operation. Every effort should therefore be made to produce clean eggs and to establish a reputation to that effect.

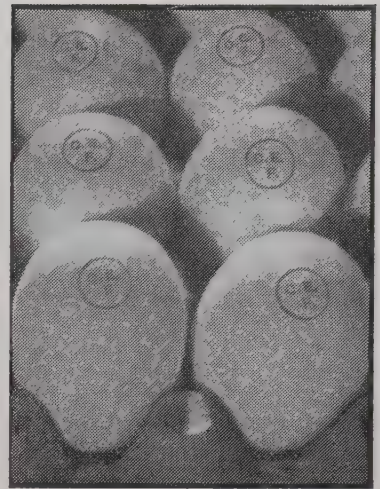
When the egg comes in contact with wet manure or moist dirt, bacteria and spores can pass through the shell pores to the inside of the egg. The dirt can be removed from the surface by washing, but nothing can be done about the bacteria which have passed through the shell. What is too often overlooked is that the washing may smear more bacteria over the shell and into the egg. Dirty eggs should be cleaned with sand-paper, mineral wool, or a scraper. Only really dirty eggs should be wiped with a damp cloth or washed, but even those should never be soaked in water, as they absorb both water and bacteria.

The obvious answer to the labour cost involved in washing dirty eggs is to produce clean ones. The poultry keeper has the initial advantage that the hen supplies the egg in a most convenient form, specially packed, wrapped with two shell membranes, and sealed with the egg shell. All the poultry keeper's skill should be directed toward producing high-quality eggs and table birds. The best way to keep the number of dirty eggs to a minimum is by careful designing of the laying house, the use of proper equipment, and sound management.

The nests should be made sufficiently high and deep, and suitable nest litter, which should be changed frequently, should be provided. Keep the floor litter dry and clean so that the hen is clean when she goes to the nest, and prevent moisture from getting into the nests. Do not permit the birds to sleep in the nests at night.

Keeping Nests Clean

Overcrowding and the accumulation of water drippings around the drinkers are the chief preventable causes of hens entering the nests with dirty feet. Permitting rain to drive in through the front of the house and muddy runs are other factors, but the poultry keeper has to compromise between allowing the rain in and keeping the sunshine out, and has to decide between the intensive and semi-intensive systems.



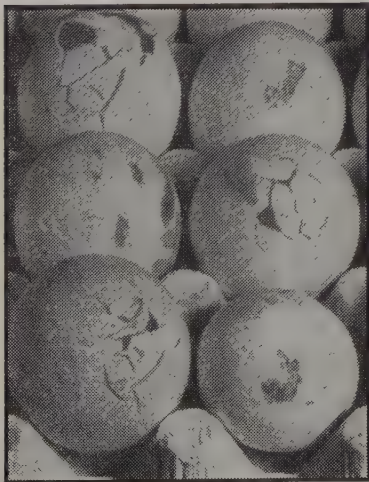
[Green and Hahn Ltd. photo.]

Clean eggs of the desirable type.

Good management requires frequent gathering of eggs, quite apart from losses from breakages caused by the hens when permitted to walk in and out of the nests for too long a period between gatherings. Much profit is lost on many farms because one hen too many tramples over a thin-shelled egg, especially when too many hens have spurs. If a producer does not want to carry the eggs to the store-room several times a day, he should suspend a perforated tin or wire basket in a shaded part of the house and place the eggs there, gathering them frequently from the nests, especially in the case of heavy-breed fowls in warm weather.

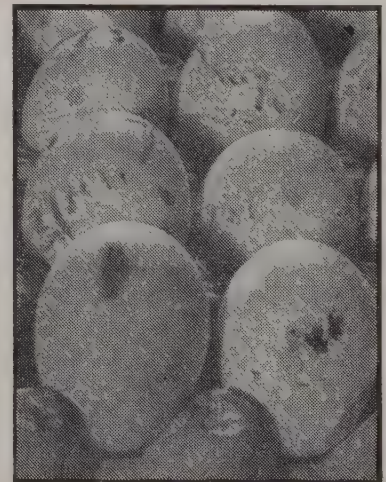
Storing Eggs

Eggs should not be left out in the sun and should not be packed in crates until they have cooled



[Green and Hahn Ltd. photo.]

Cracked and stained eggs, which deteriorate rapidly and are not acceptable to the consumer.



[Green and Hahn Ltd. photo.]

Dirty eggs, which do not find a ready market.

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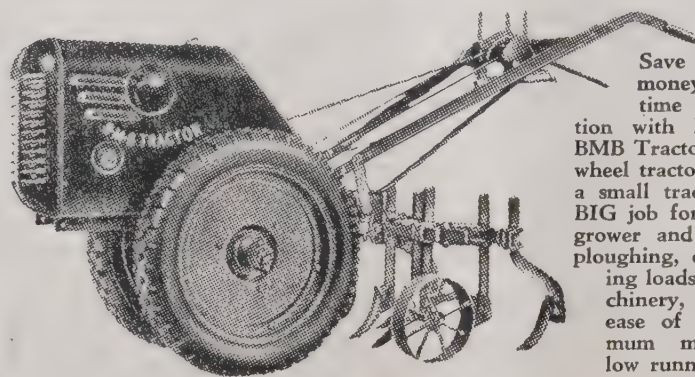
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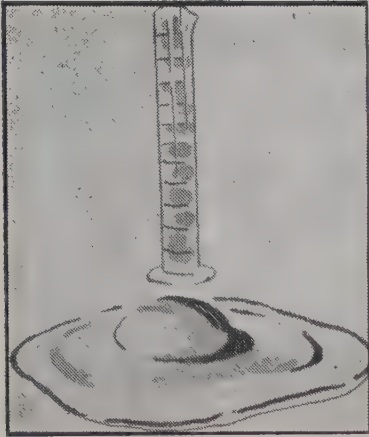
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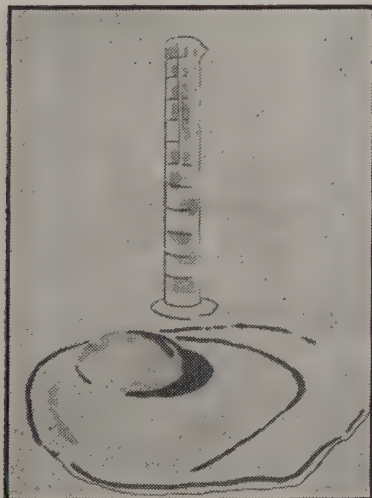


A high-quality egg with a large amount of thick white. The 12 yolks in the container are held in even, uncrowded suspension.

off. Eggs rapidly lose quality when stored under unsatisfactory holding conditions. Cooling and high humidity retard deterioration, but heat and jarring hasten it. A uniform temperature between 45 and 60 degrees F. and a relative humidity between 75 and 80 per cent. are best. Eggs should not be packed the day they are laid.

The windows of the egg room should not be on the sunny sides of the building. To increase the relative humidity an earth or concrete floor can be moistened, and good results can be obtained by hanging wet sheets or sacks over the ventilation ports.

When a fresh, white-shelled egg is held before a light it appears a pinkish yellow, with an air cell at the



A good-quality egg with a little less thick white and more thin white than a high-quality egg. The 12 yolks fill the container, but there is some crowding in the top half.

upper end about the diameter of a sixpence or even smaller. The yolk appears as a diffused shadow at about the centre of the egg. A dark spot usually follows or precedes the yolk as it turns round after the egg is twisted. This spot is one of the chalazae and is not to be confused with a meat spot. The shell membranes are firm around the air space. A brown-shelled egg looks similar, but the shell gives the contents a darker colour. Variations from these qualities occur when the egg is kept under unfavourable conditions or is stored for too long. The air cell may be larger or perhaps loosened and the yolk darker and heavier. Under ordinary conditions eggs will deteriorate in less than a week.

Factors Affecting Quality

Although it can be accepted that eggs are best when first laid, because the individual egg certainly will never be any fresher or better, it must be remembered that they are not always of high quality. Blood clots or meat spots may be present. Hens often lay eggs of varying quality. Certain hens may be of low vitality either naturally or as a result of feeding or management and are not therefore physically able to produce an egg of the highest quality.

Through fear or excitement hens sometimes withhold their eggs for a considerable time. Because of bacterial infection from the body of the hen, or because the germ in a fertile egg dies, decomposition may set in. The natural high temperature of a hen's body hastens the breaking down of the egg if it is held long within the body. An egg may reach the point where it is ready to be laid just after the hen has gone to roost in the evening and be held until the following morning. Generally it can be correctly assumed that under normal conditions the majority of newly-laid eggs are of fine quality.

Despite its quality when laid, an egg deteriorates rapidly unless checked. Its environment is a deciding factor. Because there is no known method for making an egg better in quality once it is laid, and because of early deterioration, it follows that the only chance of getting eggs to market in high quality is to provide conditions which will enable the original quality to be retained.

Importance of Temperature

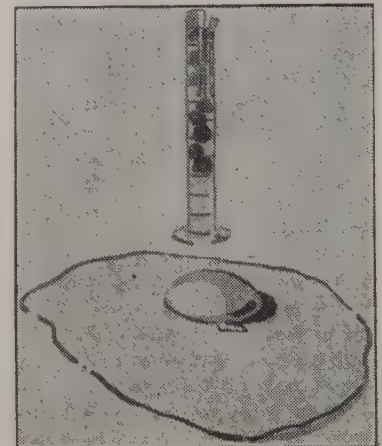
The majority of farms breed their own replacement stock and many incubate chickens for sale. From their own point of view, quite apart from supplying quality to the public, these farmers must safeguard their own interests by producing eggs which will



A third-grade egg, in which the thick white is much weaker than in the better-quality eggs. The yolks are not held in position by the albumen and there is a definite crowding upward in the container.

hatch well and develop into vigorous chickens. The importance of temperature in bringing about this result cannot be over-emphasised.

The older or more inferior an egg is the more rapidly will it be affected by extremes of temperature. Eggs should be cooled immediately after they are laid. Temperatures above 60 degrees F. are responsible for some deterioration in quality whether the egg is fertile or not, but they are especially detrimental to the fertile egg. Warm, dry air causes rapid evaporation, especially if it blows over the egg, and weak, watery eggs of a stale flavour soon result. Experiments have shown that when eggs are kept at a constant temperature the period



An egg of the lowest quality, which shows no distinction between thick and thin whites. There is less volume in the container and the yolks float high in the watery whites.

that will elapse before they deteriorate to B grade is as follows:—

Temperature degrees F.	No. of days
98.6	3
77.0	8
60.8	23
44.6	65
37.6	100

Temperature is a greater factor than age, and the importance of low temperature is evident from the above table.

In a fertile egg the embryo has been developing for several hours before the egg is laid, and if the animal heat is not removed at once, this development continues to such an extent that the embryo can be seen by candling. The temperature in the nest on a hot day can readily reach 100 degrees F. If one hen follows another on to the nest, or if broody hens are left undisturbed, the eggs may be kept at incubation temperature for several hours after being laid. The embryo, if well advanced, may die when the egg is cooled, causing the formation of a blood ring. A fertile egg kept at a temperature of even 68 degrees F. for several days will develop slightly. When the embryo dies decomposition sets in and in time the egg rots.

Removal of Male Birds

Male birds have no influence in increasing the number of eggs a hen can lay, and should not be run with the females when eggs are produced for consumption. It is particularly important that the males be removed from the laying flock during the warm months of the year.

An infertile egg will not rot if the shell is kept dry, but the quality will quickly deteriorate at temperatures above 60 degrees F.

High relative humidity surrounding eggs is desirable, as low humidity in the egg room causes moisture to be drawn from the egg. Some moisture is drawn completely through the shell, resulting in an enlarged air cell, and some is stopped in the shell, where it spreads between the layers of shell.

The egg readily absorbs odours, which may or may not be lost in cooking. Care should be taken to keep the eggs away from filth, disinfectants, kerosene, decaying matter, or any substances possessing a disagreeable odour like meat or fish meals.

The public can probably be educated to eat more eggs, but only if egg quality is maintained at a high level. The low-quality egg for the most part will come from the farm with low-quality stock, unsuitable accommodation, and/or inferior management. All these matters are within the control of poultry producers, who can assure their future markets by producing only eggs of the highest quality.

Vaccination Against Contagious Abortion

APPPLICATIONS by dairy farmers for vaccination of their calves against contagious abortion in 1948 are now due. Though 1947 was the first year in which a charge was made for this service, there was no decrease in the demand; in 1946, when the service was free, 186,780 doses of vaccine were supplied, but this year dairy farmers paid for 191,180 doses.

The following results, calculated from data supplied on the application forms, show that the vaccination of calves is providing a satisfactory immunity for at least the first three calvings:—

In 67,634 vaccinated heifers there were only 1935 abortions (2.9 per cent.) at their first calvings as two-year-olds. Of these, 23,373 have calved a second time as three-year-olds, with 553 abortions (4 per cent.), and 10,148 have calved a third time as four-year-olds, with 225 abortions (2.2 per cent.).

The corresponding abortion percentages calculated from details of all non-vaccinated animals shown in application forms are: Two-year-olds 18.8 per cent., and three-year-olds and over 6.8 per cent.

The procedure for 1948 vaccinations will be exactly the same as that for this year. The charge will be 1s. 6d. per calf for the first 14 calves in any herd and 1s. 3d. per calf thereafter. Members of veterinary clubs should apply to the secretary of their club, and all dairy farmers should apply to their nearest Stock Inspector, from whom they can obtain the necessary forms. Applications to Inspectors of Stock must be accompanied by a cash payment calculated on the basis of the charges given above. Veterinary clubs will make their own arrangements for collection of fees.

It is particularly important that applications should be forwarded by December 31. As very few heifers born after the end of October are kept, there should be no excuse for late applications, but last year only 25 per cent. of applications were received before the end of December and applications were still being received at the rate of about 1000 calves per week well into October of this year. This made it very difficult for vaccinating officers to arrange the work efficiently and added greatly to the cost, as they had to travel over the same ground several times to deal with late applicants. In view of the urgent need to conserve petrol, this will be quite impossible next year. It has been decided that a late fee of 10s. will be imposed on all applications received after January 15.

The chief points that farmers should remember are:—

1. Application forms are available at all veterinary clubs and offices of the

Department of Agriculture and should be filled in carefully and forwarded at once.

2. Cash payments must accompany applications to Inspectors of Stock.

3. The closing date for applications is December 31, and a late fee of 10s. will be charged for all applications received after January 15.

4. It may not be possible to vaccinate calves for which late applications are received.

Aid to Britain Show Exhibits

TWO special exhibits to tour A. and P. shows throughout the North and South Islands to encourage support of the Aid to Britain campaign have been sponsored by the National Council of the campaign in association with Federated Farmers and designed and built at the National Publicity Studios, Miramar, in collaboration with the P. and T. Department's workshops.

In an attractive appeal for general support of the campaign the exhibits set before farmers the targets for primary production and show how the various workers and industries are linked in the chain between producer and consumer in Great Britain.

The North Island exhibit made its first appearance at the Poverty Bay A. and P. show at Gisborne on October 17 and went on to Hastings, Hamilton, Palmerston North, and Wanganui. It is to appear at shows at Te Aroha, Waimate North, and Stratford later in November, and its schedule is continued in January.

The South Island exhibit opened its tour at the Ellesmere A. and P. show at Leeston on October 18, and continued to Timaru, Rangiora, Ashburton, and Christchurch. It is booked to appear later in November at Oamaru, Kelso, Dunedin, and Winton, and at Gore, Wyndham, and Invercargill during December, and Tuatapere in January.

YOUNG FARMERS' CLUBS

SINCE the end of the war the Young Farmers' Club movement has, with assistance from the Department of Agriculture, been reorganising and expanding and now has 302 clubs with about 9000 members between the ages of 14 and 30 years.

Matters of Dominion interest at present are the Y.F.C. land settlement scheme, which it is hoped to inaugurate as the requirements of returned servicemen have been met, and the Y.F.C. national memorial scheme for erecting buildings at Massey and Lincoln Colleges to provide young farmers with facilities for short-term courses.



Topdressing Cobalt-deficient Land from the Air

By E. D. ANDREWS, *Animal Research Station, Wallaceville*, and A. M. PRICHARD, *Aerodrome Services, Public Works Department, Wellington*.

BUSH sickness, a stock ailment affecting ruminants, occurs on lands deficient in cobalt. The disease can be cured and prevented by supplying cobalt to the animals, the most effective method being to increase the cobalt content of the herbage by topdressing with cobalt salts. Topdressing bush-sick lands with cobaltised superphosphate has now become common practice, providing a cheap, effective, and simple means of improving the cobalt status of pasture and controlling the disease. That method is readily applicable to flat lands where machinery can be employed, and hand topdressing has been resorted to on some of the steeper country, but there still remain the inaccessible blocks of land and broken hill country to which the application of fertilisers has so far proved impracticable. However, cobalt must be supplied to the stock and means

other than topdressing the pasture have hitherto been employed, though none is as effective. The use of aircraft to distribute a cobalt fertiliser would avoid the difficulties imposed by inaccessibility and broken terrain, and the successful and economic employment of such a means forms the subject of this article.

An article in the "Journal of Agriculture" for February, 1945, by one of the present writers (A. M. Prichard) described the successful sowing of lupin seed by air on sand dunes of the Ninety-Mile Beach. More recently, the late O. J. C. Anderson, Aerodrome Services, Public Works Department, Wellington, and I. J. Cunningham, Superintendent of the Animal Research Station, Wallaceville, reported in the "Journal" for September, 1946, an experimental aerial topdressing of blue-stone on 1100 acres of flat, copper-deficient peat land. The background of experience gained from those trials

The illustration in the heading shows the type of country on which the aerial topdressing experiment was carried out. Photograph by A. M. Prichard.

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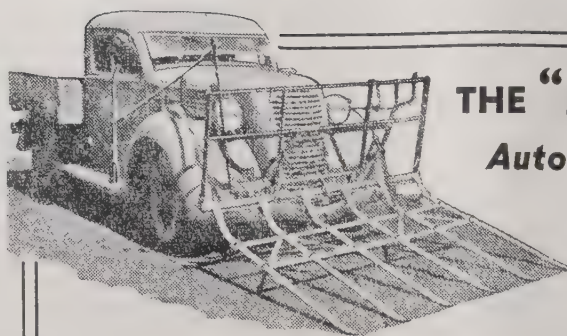
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proved of great value in the planning and execution of the present experiment, but fresh problems had to be faced. The previous experiments were carried out over flat country; in the present instance the main object was to topdress country essentially hilly. That introduced extra flying hazards, and one of the purposes of the experiment was to establish a technique designed to reduce hazards to a minimum while ensuring a satisfactory distribution of material.

While the choice of a suitable area for topdressing was under investigation a request was received by the Department of Agriculture from Mr. K. M. Hickson, Waimiha, that consideration be given to the possibility of aerially topdressing his property with cobalt. This farm, 23 miles north of Taumarunui, is 2760 acres in extent, of which 1800 acres is in pasture, 200 acres in scattered manuka, and the rest in thick manuka or native bush.

Features of the Farm

Inspection of the farm showed the following features:—

1. It is within the cobalt-deficient pumice area of the King Country.
2. It has a previous history of stock unthriftiness and mortality.
3. Access to the farm is difficult. Supplies are brought in either by pack horse over rough country for three miles or along a disused bush-tram track for about the same distance. In good weather the tram track is negotiable by a small farm truck as far as the homestead.
4. The country is mainly hilly, with a few steep faces and deep gullies, but has sufficient easy rolling and flat country to offer varied experience in the technique of aerial spreading.
5. Because of the difficulty of access and the nature of the country, normal topdressing procedures have not been feasible.

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6. A temporary airfield about 3½ miles from the homestead could be made available on the Native Development Scheme Block at Waimiha.

The cobalt-deficient nature of the farm having been confirmed by analyses of pasture samples from all the main areas, it was planned to topdress aerially at the rate of 20oz. of commercial cobalt sulphate to the acre. That figure was chosen because previous experiments had indicated that such a rate of application gave protection against bush sickness for proportionately longer than the lower rates of 5oz. and 10oz. to the acre.

In the plan on page 504 farm boundaries are indicated by broken lines and areas topdressed by heavy lines. For reference purposes it was more convenient in practice to use aerial photomaps of the farm with boundaries and areas similarly delineated. Each area contained a multiple of 60 acres, which was the area estimated to be covered by one plane load of material. As far as possible, each area was bounded by straight or regularly-curving lines to facilitate the planning and execution of aerial spreading technique. In that manner nearly all the pasture land, with some of the encroaching land in scattered manuka, was included. The total extent of the areas was 1800 acres.

Advantages of Liquid

The question arose whether it was preferable to spread cobalt sulphate in solid form or as a solution. Preliminary laboratory tests had established that a saturated solution of cobalt sulphate would not corrode any metal fittings and fabrics used in the aircraft. The use of a solution would mean that water as a diluent would represent "dead" weight in the payload, but a liquid would have the following advantages:—

1. Liquids can be readily loaded into an aircraft by a gravity system or by pumping.

2. Granular solids tend to pack under the influence of aircraft vibration, causing irregular discharge rates. The use of a liquid ensures a smooth discharge.

3. Solids must be discharged vertically, or nearly vertically, below the container, but liquids can be piped to any part of the aircraft, allowing suitable discharge points to be chosen for maximum effective spread.

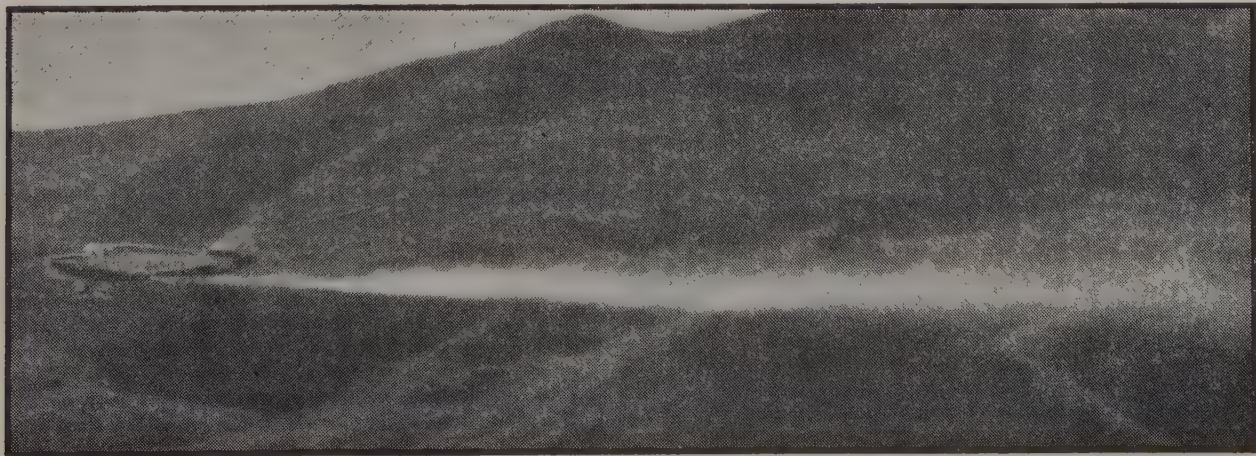
4. The maximum load can be carried only over the centre of gravity of the aircraft, which with a solid would necessitate cutting a hole for the installation of discharge equipment in the most highly-stressed part of the aircraft. As that is not feasible, it would be necessary to locate the load and discharge orifice to the rear of the centre of gravity, upsetting the trim and balance of the aircraft and reducing the load. With liquids the centre of gravity of the container system can be located over the centre of gravity of the aircraft, enabling the maximum authorised weight to be carried.

For those reasons it was decided to employ cobalt sulphate in the form of a solution.

In the aircraft used the maximum weight of solid cobalt sulphate which could have been carried was 90lb.; by using cobalt sulphate solution 310lb., containing 116lb. of cobalt sulphate, could have been carried. Because of the rather uneven nature of the field from which flying was undertaken, the load was reduced to 200lb. of solution, containing 75lb. of cobalt sulphate, to provide a wide safety margin.

Aircraft and Fittings

The aircraft available was a Whitney Straight side-by-side two-place



The fluid discharged under either wing being broken up and spread by the swirling slipstream. [Desgrange Studio photo.]

TOPDRESSING FROM THE AIR . . .

monoplane. Examination showed that removal of the passenger's seat afforded an ideal mounting place for a single tank of adequate capacity. The dimensions of the tank were 18in. diameter by 28in. long lying fore and aft on its side. The tank was fabricated from 28-gauge tin plate with spot-welded and soldered seams, ends, and baffles. Clear lacquer was floated on to all interior surfaces to prevent rust, but that treatment did not withstand hot solution and peeled off in large sheets.

A large, airtight filler cap, which also provided an inspection port, was fitted to the top, and a vent pipe forward, opening in the region of maximum pressure below the main plane, was brought up through the tank to provide pressure and so minimise the effect of change of head as the tank emptied.

The control valve, 2in. in diameter, was taken right through the tank in a similar manner to the vent. When closed it is sealed by a rubber washer expanded outward by pressure between two cramping plates, forming in effect a thin piston. Ports in the wall of the tubular valve are uncovered as the piston is raised. A smaller extension of the valve tube proper has a similar rubber piston seal to prevent splash and leakage even if the aircraft becomes inverted.

Liquid is taken from the bottom of the valve through the floor in a 2in. rubber hose to absorb random vibrations between the tank and the aircraft floor. Beneath the floor the rubber hose is attached to a short

vertical pipe closed at the bottom end, but opening out at the side into two short arms forming a broad horizontal Y. Rubber hose connects these arms to two discharge tubes, which terminate in rearward-pointing nozzles 3ft. on either side of the aircraft centre line, 2in. below the wing surface, and 1ft. in advance of the trailing edges of the wings. That position was chosen because it is close to the outer edge of the slipstream, which serves to broadcast the droplets over a wide area.

Preparation of Solution

An almost-saturated solution of commercial hydrated cobalt sulphate was prepared in 44-gallon drums by weighing 192lb. of the salt into 32 gallons of water heated to about 150 degrees F. by army petrol cookers of the blow-lamp type. The volume of the resulting solution increased to about 40 gallons. When cool the volume was somewhat less but was topped up again to 40 gallons.

The solution, which was prepared a day in advance, was warmed again before being pumped into the tank in the aircraft. It was thought that if the liquid was spread while warm there would be less danger of its crystallising out around the discharge jets to cause blockage or a lowering of the rate of flow. In practice it was found that there was no tendency for that to occur.

Measurement of Spread

As a working basis it was assumed that while topdressing was in progress

the average speed of the aircraft would be about 100 miles an hour. As the discharge rate had to be adjusted so that the aircraft could cover 60 acres as completely as possible with one load, it was necessary to determine the effective width of spread. It was decided that, where conditions permitted, the aircraft would topdress from altitudes as low as 150ft., and preliminary spreading trials were therefore conducted at that altitude. For a first approximation trials were made using water, two observers on the ground defining the width of the resulting shower. Those tests were carried out first at Rongotai and later, when the discharge rate had been adjusted, at the improvised airfield at Waimiha before topdressing commenced. Final tests were made with cobalt sulphate solution over the river valley flats of the farm (area C) during calm weather. Under those conditions a satisfactorily-even spread of about two chains could be accurately applied.

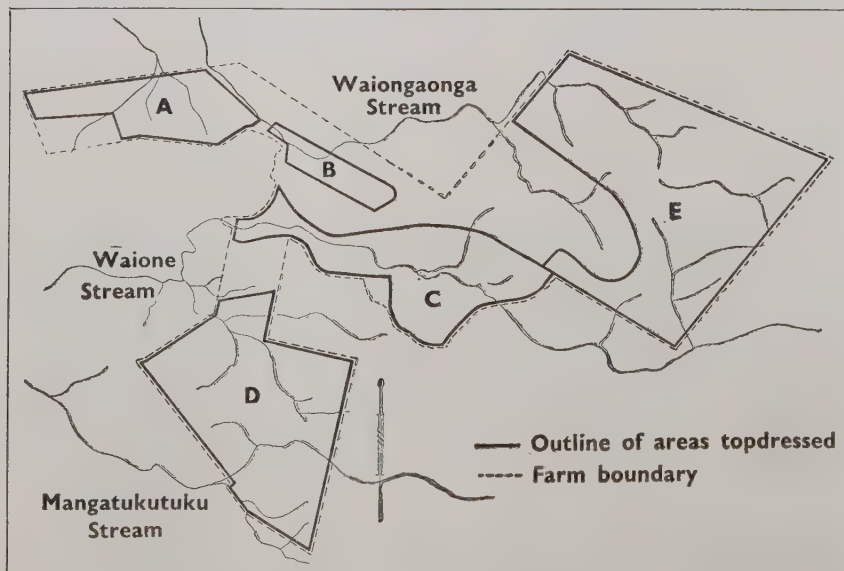
Adjustments to the rate of discharge of liquid from the tank were made by pinching up the ends of the discharge pipes. Preliminary tests were done with water on the ground, but as expected in flight the rate of discharge was raised appreciably. Finally, the discharge rate was regulated to deliver 15½ gallons of water in about 130 seconds from the air. The rate of discharge of cobalt sulphate solution was subsequently checked while spreading was in progress and gave reasonably good agreement.

For assessing the width and evenness of spread of solution over the river valley flats rolls of toilet paper were employed, chemically treated so that when drops of cobalt sulphate solution came into contact with the paper an easily-visible blue colour was produced. The rolls were pegged out in lengths of up to 150 yards at right angles to the line of flight of the aircraft. Similar tests were made while topdressing was in progress over the easy rolling country (area A). Time did not permit of the laying of test paper while topdressing the hilly country (areas D and E), where spread and drift of material had to be assessed by eye, so the information obtained was less reliable than that available for the flat and easy rolling country.

Effect of Wind

Wind speed on the ground was measured by a small cup anemometer. Width of spread varied considerably with wind direction and velocity as well as with the nature of the terrain and the altitude of the aircraft. Observations made during topdressing may be summarised as follows:—

1. In calm weather a measurable spread of about 44 yards was obtained from an altitude of 150ft. Size of drops appeared to vary from moderate-sized raindrops near the middle of the spread to small rain-



A—180 acres; easy rolling country. B—60 acres; river valley flats to north-west; higher country to south-east. C—240 acres; mainly river valley flats; higher country to south-east and north-east overlooking Waione Stream. D—540 acres; hilly country; a few steep faces. E—780 acres; hilly country; a few steep faces; steep, deep valleys in south-east corner.

drops showing less scattering toward the edges. Little or no fine spray was discernible.

2. With the fairly-steady 15 miles an hour cross-wind which prevailed from the north while topdressing was in progress over the easy rolling country (area A), a discernible spread of up to 120 yards was obtained from an altitude of 150ft. Some of the material appeared to be broken up into spray. The windward edge of the shower was considered to be displaced about 50 yards downwind before reaching the ground.

3. With turbulent 15 miles an hour south-westerly winds over the hill country (areas D and E), it was necessary to topdress from an altitude of about 200ft. above the hill-tops, which at times meant about 400ft. above valley floors. Though no accurate estimate was possible under those conditions, it was considered that with the aircraft flying cross-wind spread would be of the order of 200 yards. As before, a portion of the droplets was broken up into spray. As a rough approximation, it was estimated that in some cases a part of the material was displaced downwind for distances up to 300 yards before reaching the ground in the valleys. A complicating factor was that, while turbulent winds prevailed over the hilltops, in the valleys winds varied from calm to moderate and variable. On one occasion, while topdressing area E, the hilltop wind rose to 20 miles an hour and operations were discontinued, as it was considered that conditions were too hazardous for flying and accuracy of placing might be reduced below a satisfactory level.

Spreading Organisation

Where possible spreading was conducted according to a prearranged plan. On the river valley flats of area C banners were placed at 44-yard intervals at right angles to the line of flight. As the aircraft made a run over each banner the banner was removed. A similar system was employed in topdressing the easy rolling country (area A), where conditions allowed straight runs of a mile to be made parallel to the boundary fence.

Having established that 44-yard intervals would give the ideal coverage, the greatly-increased width of spread in cross-winds was of no great consequence. Though each run resulted in a lighter coverage than required, that was offset by the application of further material from subsequent runs over a large proportion of the area already covered by previous runs.

On the steeper country time did not permit the use of the banner system, and ground organisation was employed only in flagging boundary corners where they were not clearly delineated by fences or by contrast between

pastured land and bush. Fires were lit on prominent ridges to indicate wind speed and direction to the pilot.

Radio communication was maintained throughout the experiment by personnel of the Army Signals Wing, Trentham, permitting discussions between the pilot at the airfield and the ground organisation at the site of spreading. Radio communication with Trentham was also arranged, enabling a daily weather forecast to be obtained by telephone from Wellington and transmitted from Trentham to Waimiha.

Flying Technique

With calm conditions the chemical tests indicated a very satisfactory evenness and accuracy of spread on flat land, but with the winds which prevailed while spreading was in progress over the hill country (areas D and E) evenness and accuracy were reduced by turbulence and variable wind conditions in the valleys. To drop the load within a given area the aircraft was flown at least 300 yards inside boundaries toward which the wind was blowing.

Windy conditions necessitated considerable improvisation of flying technique according to topography and orientation of area boundaries. Where conditions allowed long straight runs, normal procedures were followed, the pilot working out a definite portion of the area by spreading at two-chain intervals as far as could be assessed by eye. Under other circumstances it was necessary to work along contours on the windward sides of ridges, leaving the valleys to leeward practically untouched. Several very deep valleys had to be left altogether to be topdressed later during early-morning calms. On a morning when conditions were sufficiently calm,

... TOPDRESSING FROM THE AIR

"filling in" work was done over the hill-country areas with the remaining portion of their cobalt requirement. That was accomplished by flying as low as possible inside boundaries, and by diving into valleys to drop further material where it was considered little or none had reached from previous applications. By those means an effective distribution was thought to have been applied to the hilly areas.

Effectiveness of Operation

The effectiveness of the topdressing may be discussed under two headings:—

1. Is aerial topdressing with cobalt sulphate technically possible in that the required amount can be distributed over a given area in such a manner as to control bush sickness effectively?

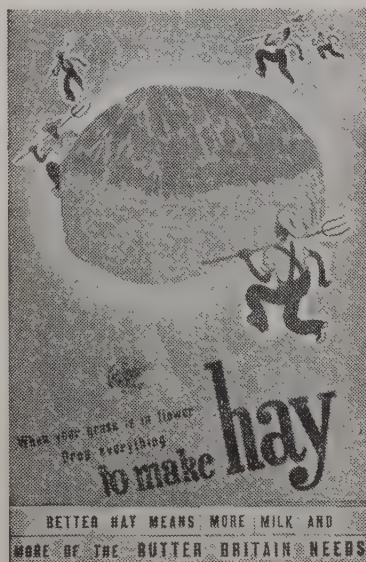
2. Is aerial topdressing with cobalt sulphate economically feasible?

This experiment has shown that cobalt sulphate can be distributed over flat country with considerable evenness and accuracy under calm conditions. With similar weather it is reasonable to suppose that a comparable evenness and accuracy could be realised over hill country. To topdress easy rolling country completely in one operation winds up to 15 miles an hour are allowable. With 15 miles an hour turbulent winds hill-country spreading can be accomplished, but small blocks of country with irregular outlines require "filling in" work under fairly-calm conditions. Winds in excess of 15 miles an hour are likely to give a less satisfactory distribution for single small-farm operations. However, if large topographical blocks were being dealt with, accurate placing would become of diminishing importance and it should therefore be possible to topdress in higher winds at greater altitudes.

Exact evenness of distribution is not essential, as the lower cobalt content of pasture topdressed at low rates is offset by the higher content of pasture topdressed at high rates, provided the grazing animal has free access over a reasonably-large part of the topdressed area. The present work was satisfactorily carried out in that cobalt sulphate was applied from the air at a rate sufficient to control bush sickness.

The economic feasibility of aerial topdressing may be considered in relation to other methods available:—

1. **Cobaltised superphosphate:** The difficulty of application and distribution costs of cobaltised superphosphate are no greater than those of ordinary superphosphate. Clearly, then, aerial topdressing of cobalt sulphate alone would have no application where it is feasible to topdress with cobaltised superphosphate by agricultural machinery or by hand. The possibility of topdressing with cobaltised or ordin-



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ary superphosphate by air poses a different set of problems to which the present work offers no direct solution.

2. Cobaltised licks: Licks are a less satisfactory alternative to topdressing in that they are uncertain in action, as some animals will not take them. Periodical labour charges are entailed in mixing licks and replenishing the lick boxes.

3. Topdressing with cobalt sulphate by hand: Few data are available for the cost of application by hand, as cobalt sulphate when applied as a topdressing is normally incorporated in superphosphate.

In the present instance, it has been estimated by the owner that the cost of application of cobalt sulphate crystals to the farm by hand would be at least 1s. an acre, a total of £90 for 1800 acres; moreover, the difficulty of securing an even distribution would be considerable. Costs of aerial application have worked out at 7d. an acre, a total of £52 10s. 0d. for 1800 acres. Assuming the cost of the

present work to be roughly representative of that of any similar enterprise, aerial topdressing would compare very favourably with hand topdressing.

In a commercial undertaking the cost of aerial topdressing would be influenced by a variety of factors, including the type of aircraft available, the weather encountered, the amount of ground organisation necessary, and the distance of a suitable landing field from the site of topdressing. Of prime importance is the size of the farm to be topdressed or the number of adjoining farms which could be done by neighbourly arrangement during one series of operations. It would be technically more simple, and therefore more economical, to topdress larger blocks of land than small.

The writers are of the opinion that the experiment has shown that cobalt sulphate can be successfully and economically distributed from the air. The particular importance of the work is that it offers a satisfactory solution to the cobalt top-

dressing problems of hill-country farmers.

Acknowledgments

The writers are indebted to Dr. I. J. Cunningham, Animal Research Station, Wallaceville, for advice and help in planning the experiment, Mr. J. Frizzell, aircraft engineer, Public Works Department, for help in the design and maintenance of equipment, Mr. E. G. Stainton, Fields Instructor, Taumarunui, for much of the preliminary organisation, Mr. E. A. Wright, Animal Research Station, Wallaceville, for assistance at the farm, Mr. L. Park, manager, Native Development Block Scheme, Waimiha, for making the airfield available and assisting in the ground organisation, and Mr. J. Allison, Waimiha, for assistance at the airfield. The writers also desire to acknowledge the assistance of the Vacuum Oil Company in providing a mechanically-operated transfer pump free, and the co-operation of Army Signals Wing, Trentham, in providing and maintaining wireless communication. The aircraft was piloted by A. M. Prichard.

SHOW DATES

THE following are dates and venues of A. and P. shows in December, January, and part of February.

December 2 and 3—Gore A. and P. at Gore.

December 6—Wyndham A. and P. at Wyndham.

December 6—Motueka A. and P. at Motueka.

December 9 and 10—Southland A. and P. at Invercargill.

December 13—Otago Peninsula A. and P. at Portobello.

January 1—Nuhaka A. and P. at Nuhaka.

January 9 and 10—Wairoa County A. and P. at Wairoa.

January 10—Blueskin A. and P. at Waitati.

January 17—Waiau A. and P. at Tautape.

January 17—Waikouaiti A. and P. at Waikouaiti.

January 23—Palmerston and Waiheho County A. and P. at Palmerston.

January 23 and 24—Taumarunui and District A. and P. at Taumarunui.

January 24—Golden Bay A. and P. at Takaka.

January 24—Marton District A. and P. at Marton.

January 26—Helensville A. and P. at Helensville.

January 29—Tauranga A. and P. at Tauranga.

January 30 and 31—Horowhenua A. and P. at Levin.

January 31—Waipukurau A. and P. at Waipukurau.

February 3 and 4—Feilding I. A. and P. at Feilding.

February 5 and 6—Feilding Ram Fair at Feilding.

February 6 and 7—Taranaki Metropolitan A. and P. at New Plymouth.

February 7—Woodville A. and P. at Woodville.

February 7—Hukerenui A. and P. at Hukerenui.

February 7—Waihi A. and P. at Waihi.

February 7—Clevedon A. and P. at Clevedon.

February 10 and 11—Dannevirke District A. and P. at Dannevirke.

February 12—Dannevirke Ram Fair at Dannevirke.

February 14—North Kaipara Agricultural Association at Paparoa.

February 14—Pahiatua A. and P. at Pahiatua.

February 14—Murchison A. and P. at Murchison.

February 14—Katikati A. and P. at Katikati.

February 14—Te Awamutu A. P. and H. at Te Awamutu.

Butterfat Prices for 1947-48

THE pay-out of 25.907d. a pound for the new season's (August 1, 1947, to July 31, 1948) butterfat announced by the Dairy Products Marketing Commission represents an increase of 2.516d. a pound over the adjusted figure for last season, made up of 0.52d. for labour reward and 1.996d. for farm working and maintenance costs.

A retrospective payment of 1.716d. a pound announced on last season's (November 1, 1946, to July 31, 1947) butterfat in cream or milk supplied

for butter or cheese manufacture to cover increased labour costs brings the total guaranteed price, with allowances, for that period to 23.391d.

The prices to be paid for butter and cheese acquired by the commission in the new season and manufactured in New Zealand are as follows:—

	d. per lb.
CREAMERY BUTTER	
Finest grade—	
94 points and over ..	23.977
93 to 93½ points ..	23.852 (basic price)
First grade—	
92 to 92½ points ..	23.7895
90 to 91½ points ..	23.602
Second grade ..	23.102
WHEY BUTTER	
First grade ..	22.852
Second grade ..	22.352
CHEESE	
Finest grade—	
94 points and over ..	13.21825
93 to 93½ points ..	13.187
First grade—	
92 to 92½ points ..	13.062 (basic price)
91 to 91½ points ..	12.9995
Second grade ..	12.812

It is estimated that these prices, which include an increase in factory cost allowances, will enable efficient dairy factory companies to pay to suppliers 25.907d. a pound for butterfat for butter manufacture and 27.907d. a pound for butterfat for cheese manufacture.

The structure of the guaranteed price for butterfat now becomes:—

	d. per lb.
Interest on capital ..	3.240
Farm working and maintenance costs ..	10.011
Labour reward ..	14.196
	27.447
Less standard allowance for pigs ..	1.540
Total	25.907

SACK MOCCASINS FOR USE IN THE SHEARING SHED

By J. H. HITCHCOCK, *Assistant Manager, Flock House Farm of Instruction.*

FOOTWEAR is a small item of the equipment needed by a shearer, but essential and very important. Not only must it enable the shearer to retain a firm grip of what is usually a slippery surface, the shearing board, but it must be comfortable and not detrimental to health. Sack moccasins, the making of which is described in this article, fulfil all those requirements and have proved very satisfactory.

A WIDE variety of footwear is worn by shearers in New Zealand—the ordinary sack moccasin, moccasins made from sheepskin and hides, light football boots without sprigs, tennis shoes, cricket boots, even cut-down gumboots, and various types of leather boots made specially for the job. Such boots are not very common in New Zealand and are usually worn by a shearer who has shorn in Australia, particularly in districts where prickly pear is prevalent and where the shearers require not only leather boots but also leather leggings and arm protection.

The chief advantage of the sack moccasin, apart from hygiene and healthiness, is the four thicknesses of sacking in the sole. Those who have experienced the soreness and fatigue of feet which can follow long hours of heavy work shearing and crutching on

a hard wooden floor when wearing unsatisfactory footwear will appreciate the value of a sole which absorbs jar and strain.

Too much stress cannot be laid on the unhealthiness of wearing rubber boots or rubber-soled footwear, such as sandshoes. In such footwear the feet perspire freely, and not only is it considered detrimental to health but results have shown that the wearing of rubber or rubber-soled footwear increases fatigue.

It is generally recognised that when a shearer or gang reports to a shed to begin shearing the provision of suitable material from which sack moccasins can be made is the responsibility of the flockmaster. Clean fertiliser and grain bags are the usual source of material from which the sack boots are made. Unless such

types of sacks are available and the position is made quite clear, sack moccasins have been known to be made from the tops or caps of wool bales (Fig. 2). In no circumstances should such material be used for this purpose, as a bale top so used immediately immobilises a wool bale, and at present wool packs are in short supply.

The making of a pair of sack moccasins does not entail much time and labour, and a well-made pair amply repays the shearer by its comfort and efficiency. A pair of shears, a sack or bag, a sack needle, and three lengths of seaming twine are all that is required to make a pair.

The Heel

The first operation is to cut the sack in halves down its length with the shears (Fig. 3). One half sack is then taken, and at about the middle of its

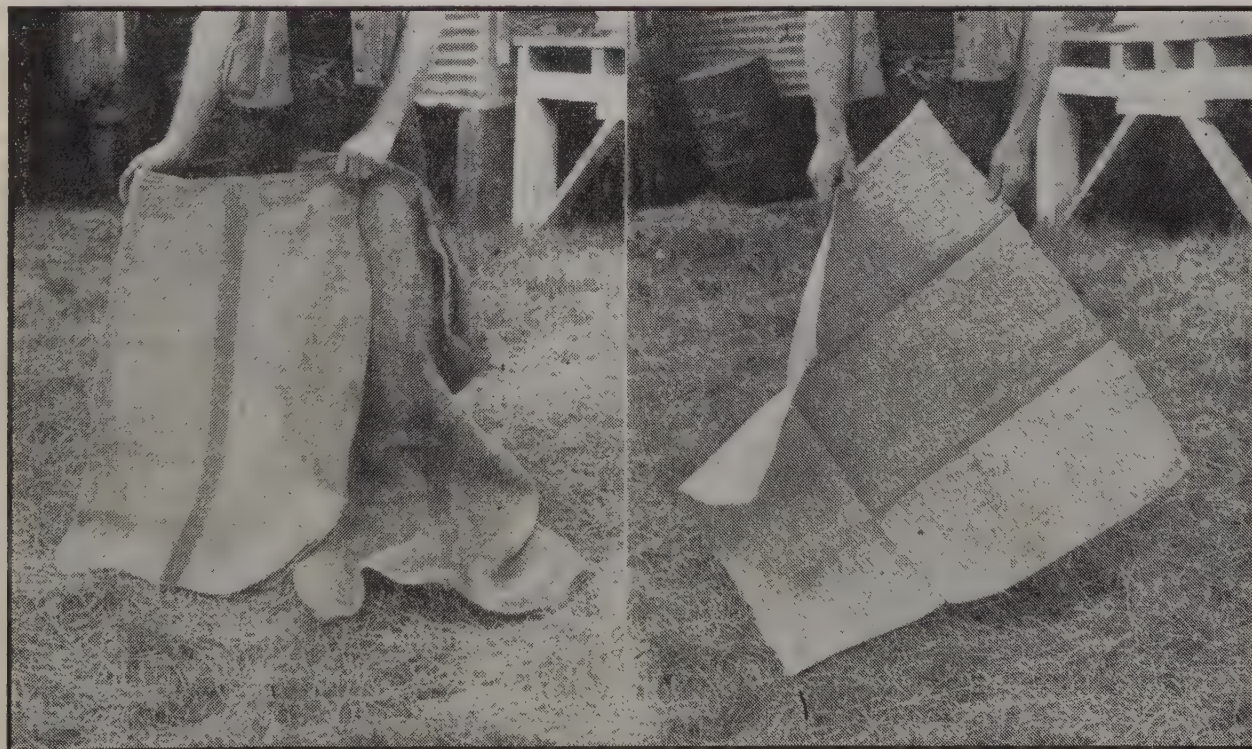


Fig. 1 (left)—Type of sack suitable for the making of moccasins. Fig. 2 (right)—What not to use: The top or cap of a wool bale.

THE MAKING OF SACK MOCCASINS



Fig. 3 (left)—Cutting down the sack with shears. Fig. 4 (right)—The half sack folded lengthwise and the tuck prepared.

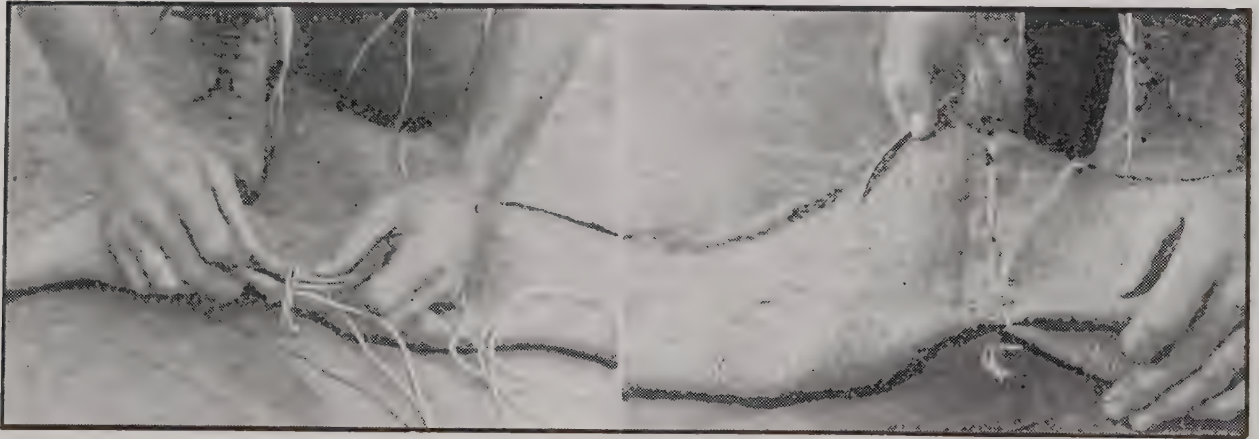


Fig. 5 (left)—The first stitch in the tuck. Fig. 6 (right)—Stitching of the heel section completed.

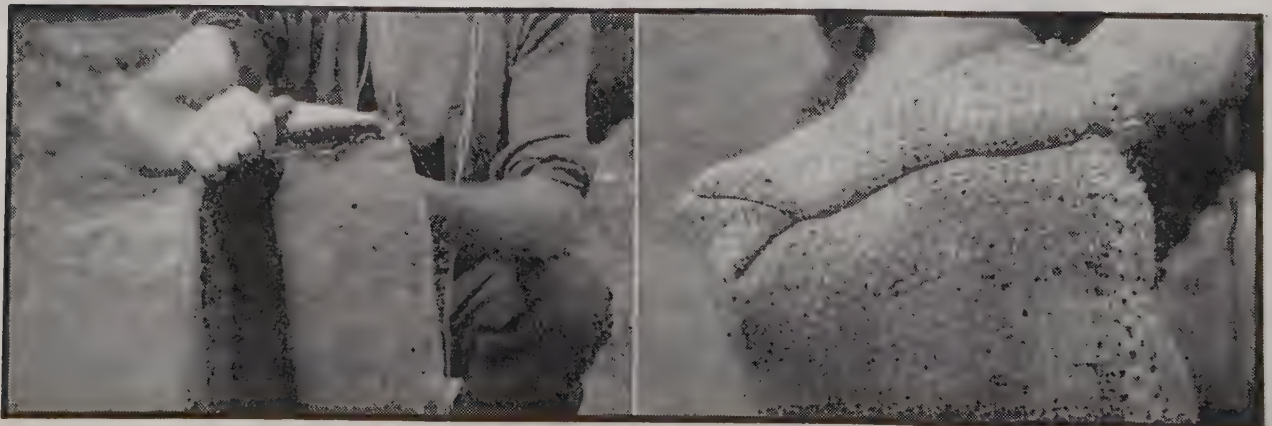


Fig. 7 (left)—Turning and shaping the heel. Fig. 8 (right)—The completed heel, showing the effect of the tuck.

THE MAKING OF SACK MOCCASINS

length a tuck is made (Fig. 4). This tuck must be held and the first stitch inserted as in Fig. 5. The seaming twine should be doubled and tied at the ends so that after the first stitch has been gathered it can be pulled tight. The stitching is then carried through as in Fig. 6, from the tuck to the outside edge of the bag and back again. This double stitching will ensure that the heel does not give. The stitching then requires tying at the tuck and the seaming twine can be cut. About half the first piece of seaming twine will be required for this length of stitching; the remaining half can be used for a similar operation on the second moccasin.

With the stitching completed and the twine cut the bagging should be picked up as shown in Fig. 7 and turned inside out, forming a neat heel (Fig. 8). A heel made in this way fits well and is comfortable. With the heel completed a foot should be placed in it (Fig. 9), making sure that the heel fits snugly. With the shears cut the two inner layers of bagging as shown, forming the inner sole of the moccasin. After completing the cut on the inner sole, cut the outer two layers of sacking 3 or 4 in. further out than the cut edge of the inner sole and roughly the same shape.

The Toe

With the superfluous sacking cut away the material is ready to be stitched and drawn together to form the moccasin. Insert a full length of seaming twine in the needle, pulling it through the eye until the ends are together; do not tie the ends. Tuck the cut edges of the sacking in (Fig. 10) and, starting on the left side of the boot, pass the needle in and out of the tucked edges, drawing the double twine through until there is an equal length on each side. By pulling firmly on the twine with both hands and assisting the tucks to form, the toe of the boot is shaped as shown in Fig. 11. When pulled up as tightly as possible the twine should be tied and will then serve as the laces of the moccasin.

By passing the needle through the top of the moccasin in two or three stitches on either side the lacing is half completed. The twine should then be cut close to the needle, the other half of the twine inserted in the eye, and the lacing completed as in Fig. 12.

If the bag is cut correctly at the toe and drawn together, a solid, neat-looking toe is formed and will protect the wearer's toes from injury by a kicking sheep. A sack moccasin made as described will last many days, and as it is built to the foot it always remains firm and snug and never becomes sloppy or untidy.



Fig. 9—Cutting out the shape of the moccasin.

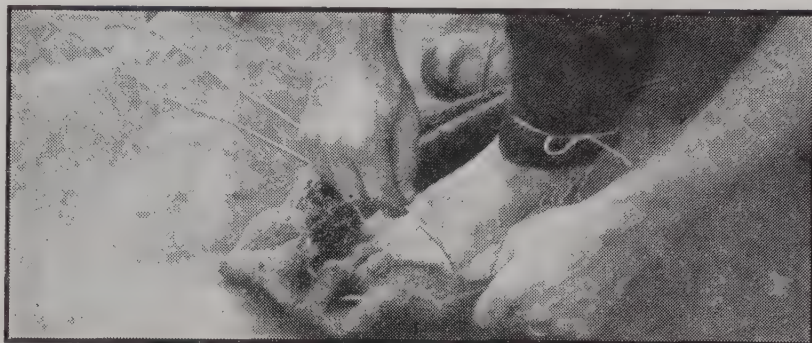


Fig. 10—The toe sewn and ready to be drawn up.

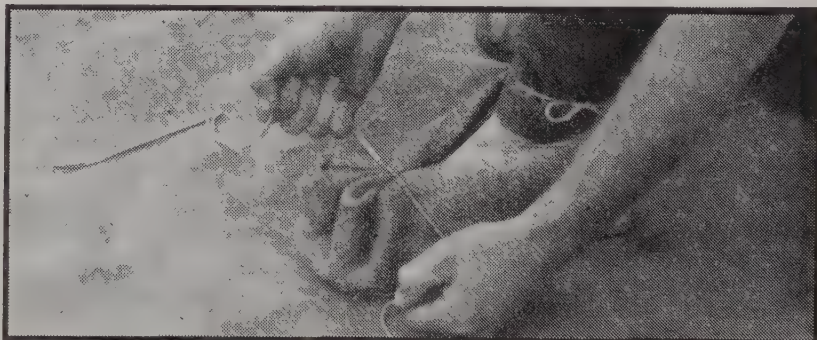


Fig. 11—The toe drawn up and tied.

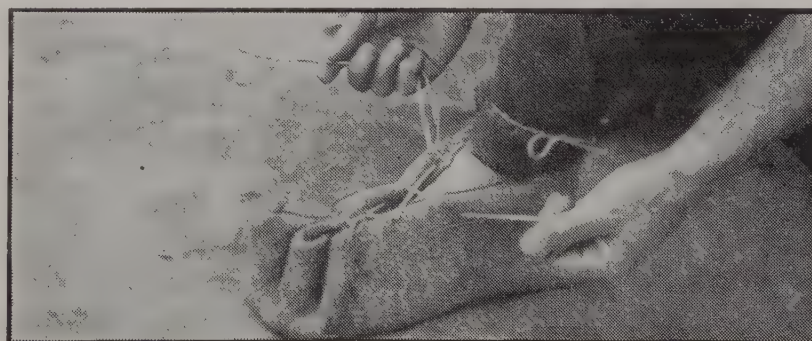


Fig. 12—Lacing the moccasin.



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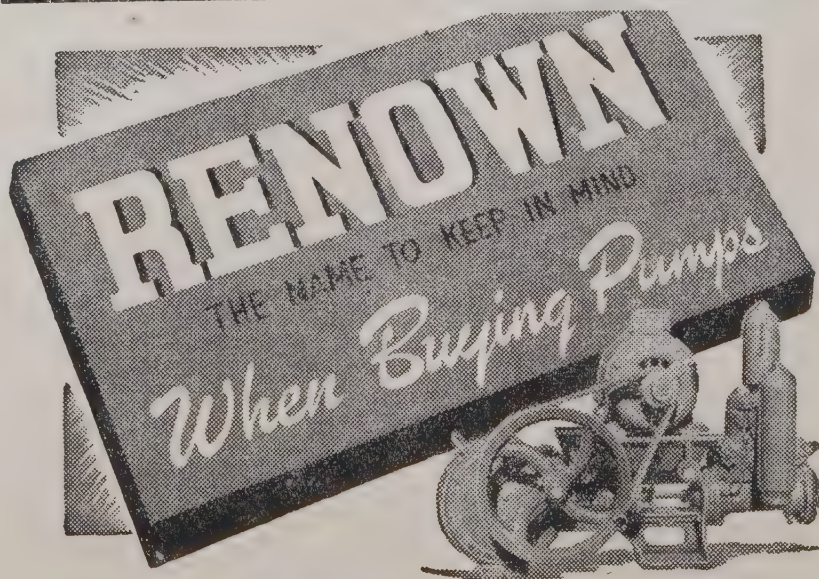
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Converting a Hand-driven Honey Extractor to Power Drive

MANY beekeepers have increased the number of their hives in recent years to meet the keen demand for honey, but have been unable to obtain large power-driven honey extractors to cope with their increased production. In this article C. R. Paterson, Apiary Instructor, Hamilton, explains how a four-frame hand-driven extractor can be readily converted to power drive.

FOUR-FRAME hand-driven honey extractors were the popular size used a few years ago by beekeepers operating from 30 to 100 hives of bees. With electric power available in most districts many beekeepers now wish to use an electric motor to drive their extractor. Attempts made to power-drive these machines, using the original gear wheels, have proved unsatisfactory for the following reasons:—

1. A very large pulley is required on the handle shaft to keep the speed in correct ratio to the reel.
 2. It is almost impossible to get the gears to mesh when the motor is running.
 3. A heavy strain is put on the whole machine if the gears are meshed before starting the motor. To overcome this a slipping belt has sometimes been used, but this method is never very reliable and makes operation of the extractor rather slow.
- If power is to be used to drive the extractor while still using the original gears, a friction clutch is the most

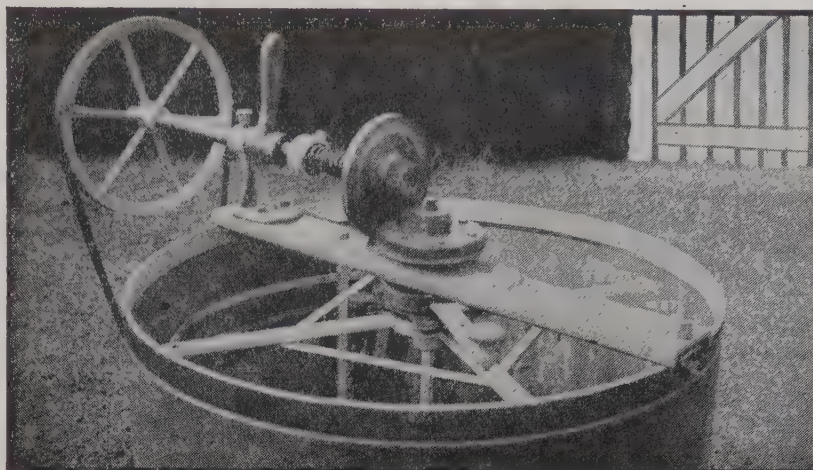


Fig. 2—A Root hand extractor converted to power drive.

satisfactory mechanism to install, but even with this method the machine takes some time to gain speed.

Quick-acting Power Drive

The simple power-drive assembly described below gives the operator complete control of his machine and speeds up the rate of honey extracting. All that is necessary is to replace the gears with a driver and friction-driven plate assembly, the component parts of which are shown in Fig. 1. It may be found necessary to alter the sizes given to suit variations in different machines. The castings require to be faced and bored to the required size on a lathe. After the layers of mason-

ite for the friction drive are firmly clamped between the casting and top plate the edges are turned down in the lathe to the required size.

A $\frac{1}{2}$ -horsepower motor makes a suitable power unit. A $2\frac{1}{2}$ in. diameter V pulley should be used on the motor and a 10in. pulley on the extractor shaft. Pender extractors are easily converted, but Root machines are a little more difficult owing to the square shaft used in the reel. This may be overcome by having four set screws which grip on to the square shaft.

Method of Operation

The machine is loaded with evenly-weighted combs, the motor is switched on, the reel given a quick turn with the hand, and the clutch lever drawn down until the driven plate engages the friction plate. Power is immediately given to the reel and in a few minutes the lever is returned to the vertical position. The brake is applied, the baskets reversed, and the operation repeated. The motor can be left running while the machine is loaded and unloaded.

Fig. 2 shows a Root extractor converted to power drive. The baskets are not in place on the reel. When the extractor illustrated is installed the long shaft on top extends through the wall of the honey house, as a $\frac{1}{2}$ -horsepower petrol engine is used to supply the power. The speed of these engines is greater than that of an electric motor, hence the necessity of a larger pulley on the driver shaft.

This method of converting a hand machine to power drive does not necessitate any alterations in the structure of the extractor. If at any time power is not available, the gears can be replaced readily and the machine restored to its original condition.

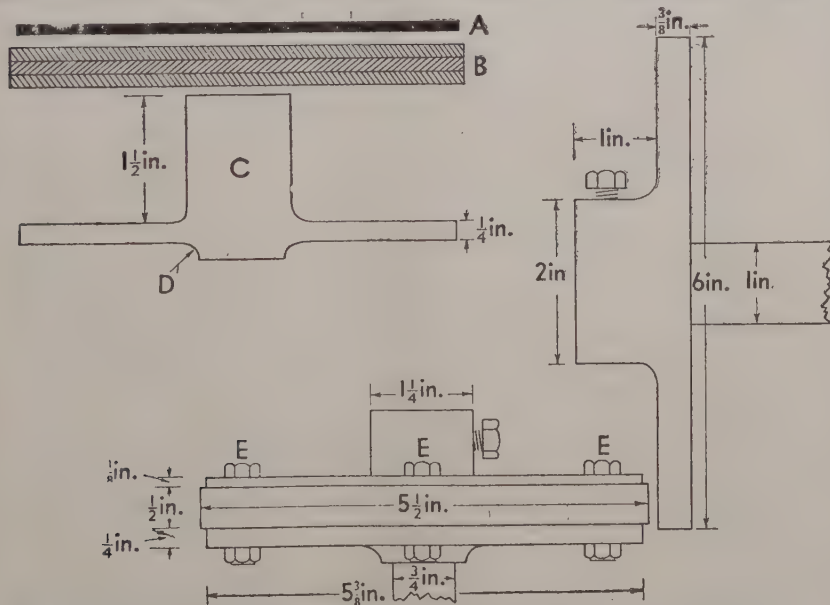


Fig. 1—The friction drive assembly. A top metal plate, B three pieces of masonite or fibre board, C metal casting, D collar to rest on thrust bearing, E six $\frac{1}{4}$ in. bolts.

Growing Turnips and Swedes

By R. INCH, *Fields Instructor, Ashburton.*

SWEDES and turnips are one of New Zealand's most valuable crops, about 400,000 acres being grown annually. They provide a large amount of succulent feed at a time when grass growth is at its minimum and, in conjunction with hay, chaff, or rough grazing, help to provide a balanced ration for stock at times when other foodstuffs are in short supply. By sowing a succession of early, main-crop, and late varieties the season of usefulness can be extended from midsummer through the winter to early spring.

TURNIPS do very well on land that has been ploughed out of old pasture where there is an abundance of well-rotted turf. To ensure that being available early ploughing is essential. Subsequent working will mix this decayed matter with the soil and so make it readily available to the growing plant. All deep cultivation should be completed some time before sowing to prevent the topsoil from drying out. During the last few weeks the ground should be harrowed at intervals of 10 to 14 days to consolidate the seed-bed and kill any young seedling weeds that may germinate.

Weeds are readily killed at this early stage. They should not be left to develop, but if knocked about with the harrows while in the two-leaf stage, or even before they appear on the surface, the delicate white stem may be broken easily. Consistent and regular harrowing at this time will give more effective control than will heavier cultivation at longer intervals. Consolidating the soil and producing a good tilth on the surface will draw soil moisture toward the top, ready to assist germination when the seed is sown. If the seed-bed is still too loose after repeated harrowing, the area can be rolled.

On the drier soils the crop is usually drilled on the flat in 7 or 14in. rows, but under damper conditions it can be sown with a ridger at 24 to 26in. intervals—a method more usual with swedes than with the faster-growing soft turnips. If the fertiliser is available, it is good practice to run the drill with extra superphosphate through a crop grown on the flat after it is 3 to 4in. high. The scratching of the coulters helps to check the weeds and the extra manure encourages the crop.

If the crop is too thick, it can be harrowed. That will thin out some of the plants, and the loosened soil will help

to conserve moisture. If grass has been sown down with the crop, this after-treatment will not be possible.

At one time turnips were usually sown at 8 to 10oz. an acre in 14in. rows, but sowing through every coulters is now becoming more general. Where that method is used the seed should be increased to 10 or 12oz., the smaller amount being preferable when sowing with grass. If the ground has been well prepared, that quantity will be ample to give a good cover and yet allow room for the bulbs to develop. If the seed is sown with grass, with pasture as the primary objective, even less can be used.

Swedes in 14in. rows require 10 to 12oz. of seed an acre, and in ridges 8 to 12oz., but if it is intended to hand-hoe the stand, the latter amount can profitably be increased to 12 to 18oz. The heavier seeding will give ample plants to allow for thinning and leave more even spacing of the crop. These seeding rates may need to be modified for special localities or soil types.

Varieties

Turnips required for summer feed can be sown in October or November, according to the locality. New Zealand Purple Globe or New Zealand Red Globe are early-maturing types, sometimes referred to as lamb turnips. They are useful for producing a good crop of early feed but, being early, do not keep so well into the winter and need to be used as soon as they are mature. As a later variety New Zealand Green Globe will be found more reliable and is probably the most popular variety for general purposes; they can be grown over a considerable period, and when sown in the New Year will keep firm for a long time. New Zealand Purple Top Yellow and New Zealand Green Top Yellow are both Aberdeen or yellow-fleshed turnips, and should be grown only in the colder or wetter districts, where insect attacks are not likely to be so severe. Resistant turnips require similar conditions and are useful in areas where there is a risk of club root.

Swedes are slower growers than turnips but have a higher feeding value. They can be classified as early-maturing, main-crop, and late types. For an early crop they can be sown in late September or October. New Zealand Superlative is a good all-round early variety, but it is not recommended for late winter feeding in areas where severe frosts are experienced. New Zealand Grandmaster, New Zealand Crimson King, and New Zealand Sensation are main-crop types and do well in a wide range of soils and climates. Sensation is suitable for dry districts. New Zealand Resistant is a late variety suitable for sowing on the heavier land that retains its moisture; it will stand hard winter frosts and is excellent for late-winter and early-spring feed; it is somewhat resistant to club root but not immune, and can be planted where club root is suspected but not where the land is badly contaminated.

Both turnip and swede crops are liable to heavy losses from attacks by the brown beetle (*Odontria zealandica*), and for early sowings the aim should be to have the crop well advanced into the rough-leaved stage before the heaviest flight takes place—usually between mid-November and mid-December, depending on the district and season. Areas that are not sown early enough to escape this heavy attack should be left until it is over.

Manuring

Reverted superphosphate or serpentine superphosphate is probably the best fertiliser for turnips and swedes, as under dry conditions straight superphosphate is likely to affect germination of the seed. Equal parts of lime and superphosphate will give results similar to reverted phosphate and can be mixed on the farm. It is preferable to do that some time before the fertiliser is required. It is best mixed on a floor, and if turned three or four times at intervals of two or three hours, and not bagged until the next day, it will keep for a long time without setting in the bags.



Sheep feeding on a crop of turnips grown in 7in. rows.

"JOY IN THE MAKING"

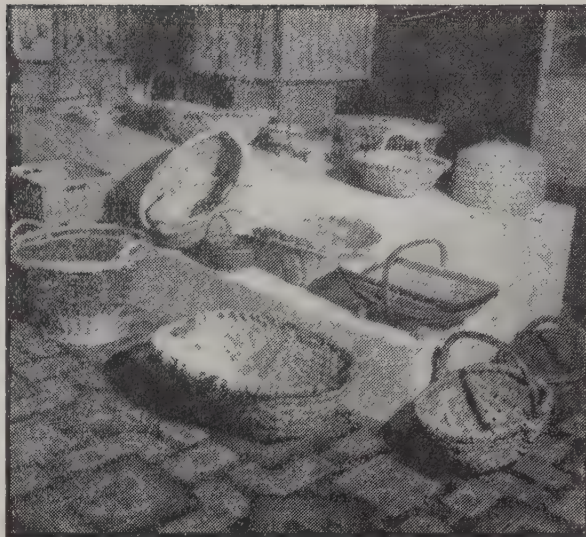
HAND-WOVEN tweeds from Scotland, Ireland, Wales, and Shetland, traditional Welsh flannels checked, striped, and plain, and Scottish tartans, among which were the Royal Stewart, Maclean, and the ancient colours of Murray and MacDonald, made a colourful background for the guests of honour at the opening of the British Rural Handicrafts Exhibition in Wellington recently. This interesting display was organised by the British Council under the patronage of His Majesty the King, and the New Zealand Government has made funds available for it to be shown throughout the Dominion. Thus, we in this country will not only have a far greater appreciation of the fine workmanship of Britain's artisans, thereby strengthening our cultural bond with the Motherland, but in perceiving the natural ability of generations of craftsmen to invest useful things with beauty we will understand something of the foundation on which the character of the British people has been built. For it is the spirit of joy, of pride in work, that is the outstanding feature of these exhibits, and, as the Prime Minister, Mr. P. Fraser, so aptly remarked, if there could be the same love of achievement in modern industry many of our problems would be solved.

An unusual exhibit was an enormous slipware teapot which could pour 200 cups or more and could be moved about on a wheeled, iron base. Many of Wellington's leading citizens were observed contemplating it somewhat covetously, no doubt considering what an asset it would be at large social gatherings.

The glossy browns and yellows of the slip (the semi-liquid clay and water decorating this type of domestic pottery) provided a distinct contrast to the dull pastel glaze of the stoneware and the light patina of the woods the turners had used with such skill. A knotted elm platter stood alongside two bowls, one of oak with wave-like grainings, and the other of polished Singalese wood. Another platter was fashioned from African walnut, and a yew tree sugar bowl and spoon had as their counterpart a set of six egg-cups on a circular stand. The Welsh cawl or porridge set was of satin smooth wood the colour of honey, and there were wooden cooking spoons and ladles with hooked handles, a sycamore grain scoop, and a swan-patterned butter print. A round milking stool of pollard oak had three legs so that it would stand firmly on uneven ground, and white cords interwoven with red dangled from a wooden yoke for carrying pails.

Ash, alder, and birch are much used for making hay-rakes, being lighter and more flexible than the metal variety, and besom brooms of lapped birch twigs or heather (the kind witches prefer for their aerial activities on Walpurgis night) are in wide demand in most parts of Britain. The models of a Surrey wain, in all the glory of royal blue and scarlet paint, and a Berkshire wagon, perfect in every detail, had been scaled down to 1:8 and 1:16 respectively, but the plaited sedge horse collar (a Norfolk fashion) and the thill harness worn by draught horses in southern and eastern England were full size, likewise the horse shoes, which ranged from the latest racing tip of aluminium alloy to a rusty shoe of the Saxon period and a heavy iron disc with a bite out of it, of probably even greater antiquity, as it was discovered under the foundations of Winchester Cathedral. The present-day horse brasses, however, still keep the sun and crescent moon and the leaf and lyre shapes deemed lucky hundreds of years ago, and the corn dollies featured in harvest festival services are relics of pagan ritual when farmers invoked the blessing of the corn-spirit and gave thanks for bountiful crops. The straw dolly, which may take the simple form of a corn neck, a horse's collar, a shepherd's crook, or an elaborate "table" pattern decorated with bows of blue ribbon and bunches of wheat, is always woven from the final sheaf to be gathered in, the fascinating spiral effect being obtained by plaiting five straws.

Straw plaits of varying designs (whipcord, white diamond, wisp, etc.) are also used for making hats, and fields and hedgerows yield a treasure trove of colour for the wools which deft-fingered women spin with wheel or spindle. A skein of hand-spun wool dyed with weld had the yellow brilliance of a bank of buttercups in the sunlight. Gorse flowers tinted



[Photo News Ltd. photo.]

a dainty "feather and fan" baby bonnet, and a child's woollen gloves were flecked and tipped with indigo, and there were other hand-knitted gloves and a cap of rose-madder and white. The fishermen's jerseys of dark-blue yarn, called "dog's hair and oakum," were distinctive in their traditional patternings, and the outstanding example of Shetland knitting was a shawl of such gossamer delicacy that it was hard to believe it had been knitted with 2-ply in the usual manner. Actually the wool was from the beards of the sheep, where it is exceptionally long and fine.

The interlining in Welsh quilts was also of sheep's wool, the design being worked in running stitch. So expert do the quilters become that they can complete a double-bed cover like the rose-lined beige one on display in just over a month's spare-time work, but the patchwork quilt of pale-blue cotton adorned with multi-hued, hexagonal motifs bearing a bird or blossom in the centre took considerably longer to make, for each little patch had to be oversewn into place before the cut-paper shapes underneath were removed. This quilt was presented to Princess Elizabeth by a Women's Institute in Yorkshire. Smocking is another branch of needlework which has never lost its popularity, and a child's smock in natural-coloured linen had tree and leaf embroidery at each side of the gathered panel in the middle of the yoke. It was really a replica of the garment worn by a Dorset woodman of old.

Trees play an important part in the manufacture of baskets, willows peeled and unpeeled providing the principal materials for shopping baskets, potato skeps, turnip swills, corn scuttles, cattle feeders, fowl crates, and large, round lobster pots. The attractive reddish shade of some of these articles was obtained by boiling the withes before peeling them. The trug baskets, product of Sussex only, and particularly suitable for garden use, being curved to just the right depth for holding flowers, fruit, plants or vegetables, were made of willow slats nailed together within an oblong chestnut frame, and had half-hoop handles of chestnut. The cradle-shaped Lancashire potato baskets, measuring up to 28in. in length, were of oak spale, and so were the cockle-gathering baskets from Monmouthshire, but the shopping baskets belonging to the latter county were of larch strips. A charming little "thrill" basket had been woven out of dogwood, clematis, and wisteria vines by a member of a Surrey Women's Institute.

Surely there can be few people so unresponsive to beauty that they can look upon this handiwork of Britain's rural craftsmen and women without making the personal resolve so ably expressed by Robert Bridges, the late Poet Laureate:—

*I too will something make
And joy in the making.*

Mary



Christmas Dinner

By EVA TOPPING, *Rural Sociologist, Auckland.*

THE Christmas dinner suggested in this article, though festive, need not keep the cook chained to the kitchen and will give her time to join in the celebrations of her family or guests. Much of the preparation can be done the previous day, leaving as little as possible but the actual cooking for Christmas Day.

THE chicken can be dressed and made ready for the oven, and seasoning made and set aside in a basin in a cool place. The seasoning can be inserted and the bird trussed and sewn up if there is a very cool storage place, an ice chest, or a refrigerator; this is not advisable otherwise, as the moistened bread might cause souring if enclosed in the chicken overnight and not stored at a low temperature. The brown gravy, made from the giblets, can be cooked on the previous day, strained, and left to be finished and reheated when required. The peas can be shelled beforehand, but the potatoes should not be scraped until just before being cooked.

The plum pudding and mincemeat can be made well ahead of the great day—even a week or two before—and both will be all the better for having mellowed. A few hours' steady steaming will then be all that the pudding

needs before being served, and the mince pies can be made on Christmas Eve and reheated or served cold when required, according to the family's preferences. Dried fruits are still hard to come by, so the pudding and mincemeat recipes offered are easy on those ingredients. A chicken weighing about 4 to 4½ lb. when dressed, served with the accompaniments given, will provide a dinner for six people.

Advance Preparations

Recipes for the pudding and mincemeat come first, as they will be used some time in advance.

Christmas Plum Pludding

6oz. of flour
6oz. of suet
Grated rind of lemon
2 tablespoons of golden syrup
½ teaspoon of ground nutmeg
½ teaspoon of ground ginger
½ teaspoon of ground mixed spice
½ teaspoon of salt

6oz. of breadcrumbs
4 eggs
6oz. of sugar
1lb. of mixed fruit
1 dessertspoon of cocoa
1 flat teaspoon of baking powder
½ pint of milk
1 wineglass of spirits or wine (optional)

Roast Chicken
with seasoning
Sausages
Bacon
Brown Gravy
Bread Sauce
Green Peas
New Potatoes

Plum Pudding
Sauce

Mince Pies

Summer Punch

Prepare the fruit, adding chopped nuts and more fruit up to 2lb. if available. Chop the suet very finely or shred it on a grater. Sift the flour, salt, spices, baking powder, and cocoa into a basin. Add the breadcrumbs, suet, and fruit. Make a well in the centre, add the eggs, lightly beaten, and the golden syrup. Mix with the milk to a firm dropping consistency.

Photograph in heading by Sparrow Industrial Pictures Ltd.

Leave the mixture to stand for $\frac{1}{2}$ to 1 hour, then add the wine or spirits if desired and more milk if the mixture appears too stiff. Add some threepenny pieces (washed and dried), or silver lucky charms for a little excitement at dinner time.

Grease a basin thoroughly and turn the mixture in, leaving a little space at the top for the pudding to swell. Cover it with greased paper and tie on a pudding cloth, making a fold or tuck across the basin top so that the pudding is not prevented from rising. Tie the cloth firmly and pin the corners together on top to make removal easy. Set the basin in a saucepan with boiling water to reach half to three-quarters of the way up the sides of the basin and boil it for 6 hours. Replenish the water as required during cooking with boiling water only. Leave the pudding to cool, put on a clean greased paper and clean pudding cloth, then store it in a cool place. Reheat it by setting it in a saucepan with boiling water as before and steaming it for 3 hours.

Mincemeat

6oz. of chopped suet	$\frac{1}{2}$ teaspoon of ground nutmeg
$\frac{1}{4}$ lb. of dried fruit	$\frac{1}{2}$ teaspoon of ground cloves
$\frac{1}{4}$ lb. of chopped apples	$\frac{1}{2}$ teaspoon of ground all spice
Rind and juice of one large lemon	$\frac{1}{2}$ teaspoon of salt
$\frac{1}{2}$ teaspoon of ground ginger	$\frac{1}{2}$ pint of sherry or rum
6oz. of sugar	

Prepare the fruit and chop the suet. Peel, core, and chop the apples, measuring the quantity after preparation. Mix all the ingredients together except the rum or sherry, leave them to stand for 24 hours, then add the spirits or wine. Pack the mincemeat into jam pots, cover them, and store them in a cool place. If sherry or rum is not used, add the juice of another lemon and 1 dessertspoon of vinegar if the mincemeat is to be kept for a period.

Mince Pies

Make a good short pastry, roll it thin, and cut it into rounds to fit patty pans. Line greased tins with pastry circles and place 1 teaspoon of mincemeat on each. Moisten the edges of the circles and cover each with another. Press round the mincemeat with the fingers and make a hole in the centre with a skewer or steel knitting needle. Brush the pies lightly with water, dredge them with sugar, and bake them in a moderate oven until the pastry is cooked and lightly browned. Reheat them when required or serve them cold.

Christmas Eve Preparations

Preparing the Chicken

When poultry is bought it is usually fully drawn, but if it is killed on the farm, the dressing is often done by the housewife, so here are some hints which may be helpful:—

CHRISTMAS DINNER



[Sparrow Industrial Pictures Ltd. photo.]

The mince pies can be made on Christmas Eve and reheated or served cold when required.

Plucking is easier if done while the bird is still warm, but if it has had to be left, the bird can be plunged into boiling water, though only for a few moments, as longer immersion tends to make the skin tough. Begin the plucking by removing all the soft feathers, taking a few at a time and being careful not to tear the skin; then pull out the hard feathers.

Singeing: The flame from a lighted piece of folded paper or a wax taper will singe off the soft down and hairs, but care should be taken not to scorch or smoke the skin. A small piece of cotton wool tied to a stick and soaked in methylated spirit gives a smokeless flame which is good for singeing poultry.

Drawing: First cut off the head about 3in. from the body. Split the skin down the back of the neck, loosen it, and remove the neck where it joins the body. Take out the crop by inserting the fingers at the neck and breaking the threads which attach it to the frame. Cut a piece off the vent, then make another cut crosswise. With the fingers, loosen the inside and carefully draw it out, taking care not to break the gall bladder on the liver, as even one drop of the contents will give a bitter, unpleasant taste to any flesh it touches. Make sure the lungs are entirely removed. Cut through the thickest part of the gizzard until the inner lining is reached, remove the gritty contents, and peel off the lining. Put the neck, cleaned gizzard, and the liver, with gall bladder removed, on one side.

Cut the tips off the wings and put them with the giblets. Make a lengthwise cut in the leg under the "knee joint" and remove the tendons, of which there are seven in each leg; pick them up singly with a strong skewer and pull them from the drumsticks, then cut off the feet at the leg joint. Cut out the oil sac at the point of the "parson's nose." Wipe the inside of the bird with a damp cloth but do not wash it, wipe over the outside, and dry the skin. If the backbone is crooked, flatten it with a rolling pin so that the bird will rest evenly on the roasting tin and serving dish. Set the bird aside in a cool safe until it is required to be stuffed and trussed before being cooked.

Seasoning

3 tablespoons of chopped parsley	$\frac{1}{2}$ teaspoon of salt
6 tablespoons of fine breadcrumbs	1 to 2 teaspoons of thyme
9 tablespoons of chopped suet	$\frac{1}{2}$ lb. of sausages
	1 egg
	Juice of 1 lemon

Make breadcrumbs from pieces of stale white or brown bread with the crusts removed. Chop the parsley coarsely and the suet very finely. If using fresh thyme, put the sprigs in a cool oven to dry, then strip the leaves from the stalk. Combine the parsley, thyme, suet, salt, and breadcrumbs, moisten them with lemon juice, and mix them with sufficient slightly-beaten egg to bind the mixture. Divide the seasoning into two portions; skin the sausages, and mix them with one portion. Store the seasoning in a cool place overnight. Next day when stuffing the chicken

CHRISTMAS DINNER . . .

place the larger sausage portion in the body of the bird.

Gravy

Peel and slice a small onion and brown it in 1 tablespoon of melted dripping. Add the washed giblets, $\frac{1}{2}$ teaspoon of salt, a sprig of thyme and two of parsley, a little pepper, bacon rinds, and 1 pint of water, and simmer them for $1\frac{1}{2}$ hours. Take out the liver, mash it with the back of a spoon, return it to the saucepan, and simmer the gravy for 10 minutes longer. Then strain it into a small basin and store it in a cool place until required. Do not discard the giblets; they can be added to the carcass and any leftovers and will help to make chicken soup for Boxing Day.

If the peas are shelled and table decorations arranged, the tasks that can be done on the previous day for the Christmas dinner will be completed.

Christmas Day

Trussing the Chicken

Fill the neck with the herb seasoning, pushing it well up toward the breast, but do not pack it too tightly as there must be sufficient room for it to expand in cooking. Turn the flap of skin over to the back. Fill the body cavity with the sausage stuffing and any which may be left over from the neck. Turn the wings so that they lie close to the sides with the points under the back and over the neck flap. Thread a trussing needle or large darning needle with fine string and sew the neck flap to the back, pull the wings into place, and tie the string over them. Push the legs back close to the body; tie a string round the bone at the end of one leg, thread the

needle again, insert it through the tail, tie the end of string over the other leg bone, and pull it tight, tying it securely with the two ends of the drumsticks close to the tail.

Cooking the Chicken

Brush over the skin with melted dripping or bacon fat, covering it well, especially over the breast, and set the bird on its back in a roasting pan containing 2 tablespoons of dripping. Cook it in a moderately hot oven for 15 minutes, then reduce the heat to moderate and continue cooking for 20 minutes for each 1lb. dressed weight of the bird; thus for a $4\frac{1}{2}$ lb. chicken $1\frac{1}{2}$ hours is the time to allow. Keep the bird well basted, turning it on each side in turn during cooking. Half an hour before it should be cooked lay about six slices of bacon over the breast and legs and put 1lb. or more of pork sausages in the pan.

Do not use a fork to turn the bird while it is cooking or the skin will break where it is pierced; use pieces of kitchen paper to protect the fingers and lift the chicken by the head and tail ends. Do not season the outside, and do not use water in the roasting pan or put a cover over it; if that is done, the chicken will be steamed instead of roasted and the skin may break and will not be crisp.

Bread Sauce

Cut a thick slice of white bread, remove the crusts, and put it into a basin with $\frac{1}{2}$ oz. of butter, salt, and pepper. Peel a small onion, stick three or four cloves in it, and boil it in $\frac{1}{2}$ pint of milk. Pour the boiling milk over the bread, cover it with a plate, and stand it in a hot place for 20 minutes. Remove the onion, beat the bread with a fork, pour it into a saucepan, and heat it thoroughly before serving.

Dishing the Chicken

Take the roasting tin out of the oven, undo the string, and pull it out of the bird. Set the chicken on a hot serving dish and arrange the bacon and sausages. Put it on a rack or in the oven with the door open to keep thoroughly hot while the rest of the dinner is dished. Pour the fat from the roasting tin, leaving about 2 table-spoonfuls. Set the tin over the heat, shake in 2 tablespoons of flour, and stir until it is well browned. Pour in the strained, heated gravy, stir until it is thickened, and turn it into a warmed gravy boat.

Vegetables

Cook the required amount of potatoes in boiling salted water with a sprig of mint.

Young, tender, new season's peas will need cooking for only 10 to 12 minutes in boiling salted water with

1 teaspoon of sugar and a sprig of mint. Turn them into a heated vegetable dish, remove the mint, and add a knob of butter.

Sauce for the Pudding

$1\frac{1}{2}$ cups of sugar	1 tablespoon of corn-flour
1 dessertspoon of butter	$\frac{1}{2}$ teaspoon of vanilla
2 cups of boiling water	or rum essence
	$\frac{1}{2}$ cup of cold water

Melt the sugar in an aluminium or iron saucepan until it is a rich amber colour. Add 2 cups of boiling water and boil it until the sugar is dissolved. Add the butter and the cornflour blended with the cold water, and stir until the sauce is thickened. Take it from the heat and add the vanilla or rum essence and a pinch of salt.

Summer Punch

$\frac{1}{2}$ cup of water	1 small bottle of soda water
Juice of 3 lemons	1 small bottle of ginger ale
Juice of 3 oranges or grapefruit	1 small bottle of another flavour of soft drink
$\frac{1}{2}$ cup of tea	
1 cup of fruit juice	

Make extra tea at a previous meal, pour half a cup without milk or sugar, and reserve it for the punch. Boil the sugar and water for 5 minutes, add the $\frac{1}{2}$ cup of tea and lemon, orange, and other juices. Preserved grapefruit or orange juice can be used in place of the fresh if the fruits are unobtainable. The fruit juice needed can be from stewed plums, rhubarb, or syrup from tinned or home-bottled fruit. Fresh strawberry juice is excellent and if strawberries are grown in the home garden, the small or misshapen ones can be stewed, pulped, and strained for the punch.

Mix the ingredients together well, pour them into a glass jug, and stand it aside in the coolest possible place. Just before serving, add the ginger ale, soda water, and other soft drink of any flavour preferred. Float slices of lemon and sprigs of mint on the top and add some cubes of ice if available.

THE PEACOCKS

*Low in the woods of quietness
In that still hour of noon
Down from massed banks of whiteness
Murmured and fell a croon.
And Jennifer paused and listened
Midst drooping calls and cries,
And parted boughs that glistened
To gaze with wondering eyes.
She saw the peacocks going
In stately steps of pride—
The jewels of Juno's sowing
So bright since Argus died.
Rich birds from an old story
With plumage bright as glass,
And crests of brilliant glory
They grouped upon the grass.
And from the brooks and boulders
A hush grew where she stood
And fell about her shoulders
From old trees of the wood.*

—Mary R. Gullery.



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What Housewives Want in a Kitchen

By NORMA K. METSON,
Rural Sociologist, Wellington.

IF the opportunity arose to ask 300 farm housewives "What do you want in your kitchen?" what would be their answers? Would they be as different as the 300 individuals supplying them, or would they show certain trends and uniformities growing out of the common tasks which are part of housekeeping experience? With the rural housing survey at present being conducted by the Department of Agriculture some progress is being made in this important type of fact-finding.

RESULTS are not perfect because personal interviews are impossible; a questionnaire form, no matter how carefully designed, is open to misinterpretation and can provide for only a limited choice of responses. But, from a summary of the answers to a group of questions on details of kitchen planning, collective preference is for a medium to large room, with at least one auxiliary room, pantry, storeroom, or scullery. Electricity is the choice for cooking, with an open fire for supplementary heating. Most families wish to have every-day meals in the kitchen, but desire some additional dining space for use when guests are present.

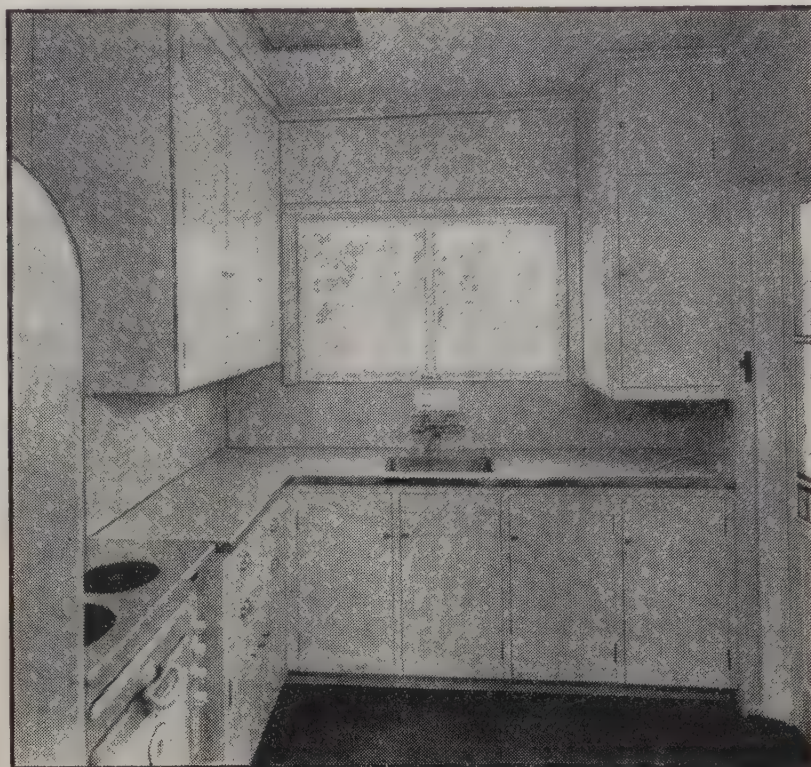
The completed survey will describe farm housing in some detail; this article is a preliminary analysis of the sections on kitchen planning in 320

forms already collected. They cover a good range of New Zealand farms from the smallest to the largest, widely scattered and representing many different types of rural life. The houses vary from those with all modern conveniences to those with none; some

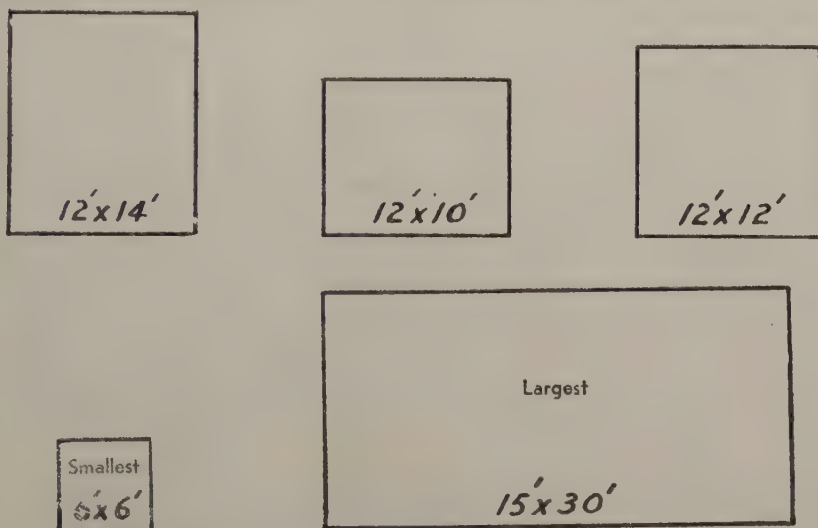
occupants are satisfied with and proud of their homes, others use forceful language to express their disapproval of various features or of the whole house. Complete accuracy or truly representative sampling is not claimed, but the general results are interesting. So are the specific suggestions made by people who were enthusiastic enough to give descriptions of arrangements they had found particularly convenient, some of which were described in the "Journal" last month.

Variety of Functions

The questions asked were designed to obtain basic information necessary for successful kitchen planning—the over-all size desired, methods of cooking and heating favoured, auxiliary rooms required, and preferences about the location of space for having meals. The uses made of the kitchen vary widely. In some cases it has been planned as an all-purpose room and caters quite adequately for family living; in others many functions are crowded into a space which is much too small and ill equipped to allow for either efficiency of work or enjoyment of leisure. And adequate space is important; there is something very depressing about the too-close physical presence of walls and furniture.

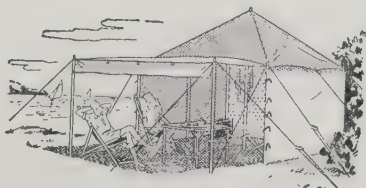


[Sparrow Industrial Pictures Ltd. photo.]



The sizes of kitchens preferred. The three at the top were the most popular choices; the two below the extremes of choices.

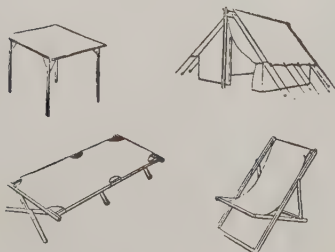
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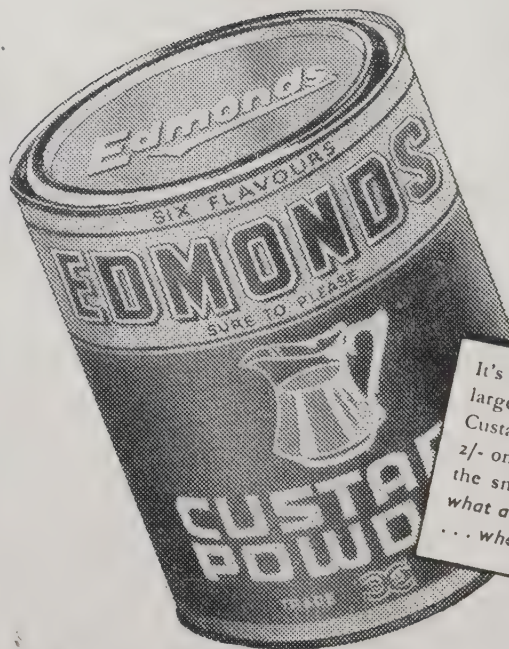
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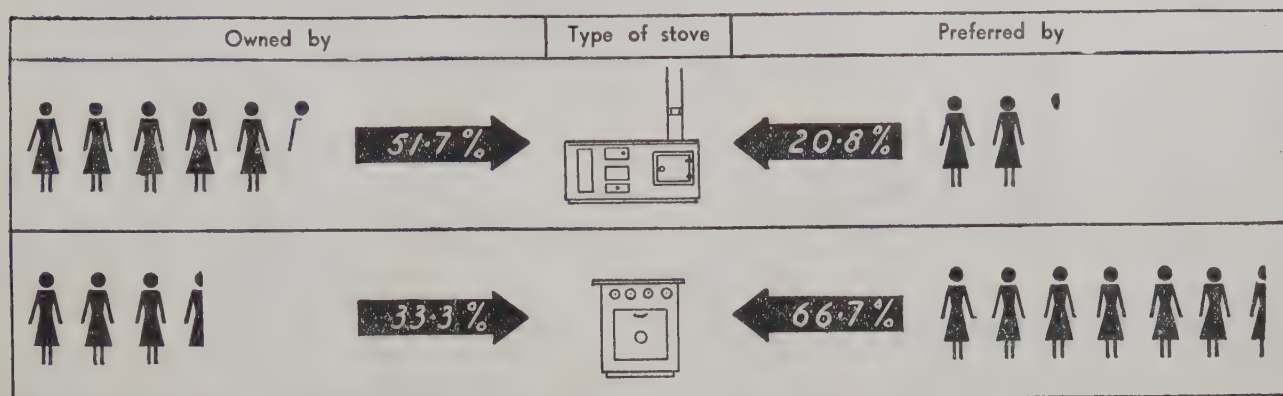
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HOUSEWIVES' PREFERENCES



Preferences of Size

Size is closely related to function. Preference for a large room almost always indicates that space is wanted for dining and living as well as for the usual kitchen work. Size of family is the next consideration. A two-person family may find having all their meals in the kitchen quite convenient, using only a small utility table which is also a part of the kitchen work equipment. Meal table and chairs for six people, however, will occupy 60 or 70 square feet of floor space when in use. One-third of those who answered were satisfied with the size and shape of their kitchens, but 43 per cent. wanted a larger room and 22 per cent. a smaller one. The desire for small adjustments rather than major changes was common—for example, an extra 2ft. in width or length “so that two people can work at the bench in comfort,” or “then the ones sitting on the side nearest the stove would not be roasted at mealtimes.”

This preference for a roomy kitchen is again illustrated in a closer examination of the measurements given for present kitchens and those desired. Of the large rooms—over 196 square feet (14ft. x 14ft.)—23 per cent. had them and an equal number wanted them. In the small room group—under 140 square feet (14ft. x 10ft.)—38 per cent. had them and 32 per cent. wanted them. The intermediate group—140 to 196 square feet—found the greatest number of both owners and those who wished to own them; 39 per cent. had them and 44 per cent. wanted them.

The most popular sizes were 12ft. x 14ft. (168 square feet), with 24 votes; 12ft. x 10ft. (120 square feet), with 23; and 12ft. x 12ft. (144 square feet), with 19; together these account for one third of the total. Rooms 12ft. x 14ft., 12ft. x 15ft., and 12ft. x 16ft. total more than one-fifth. From those figures, a smaller kitchen 12ft. x 10ft., a medium one 12ft. x 15ft., and a large size per-

haps 14ft. x 16ft. would express fairly accurately the mean of housewives' desires.

Storage Space

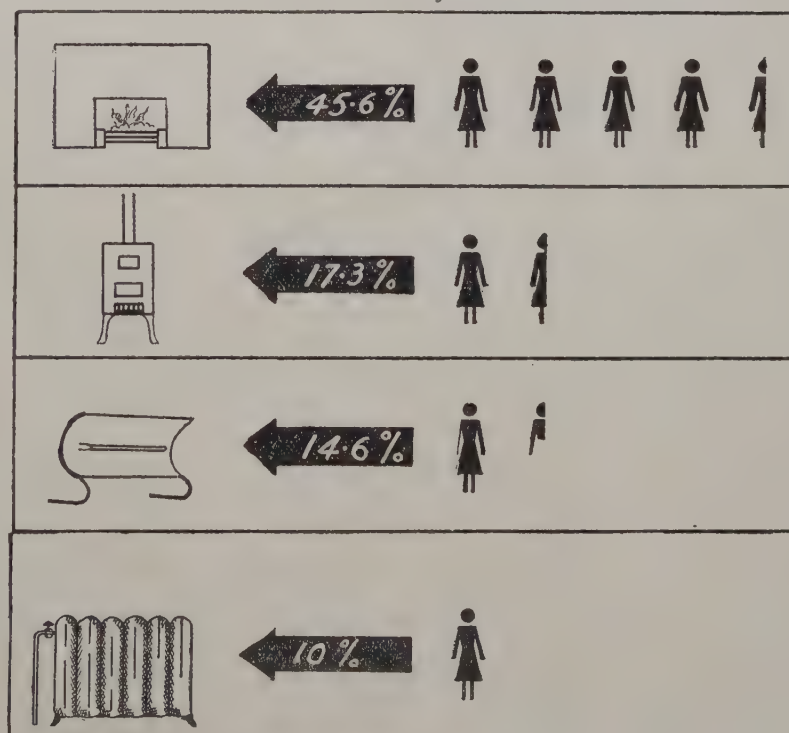
By itself the kitchen is not considered adequate for all necessary work and storage. Even with the proviso that the kitchen should contain plenty of built-in cupboards, 58 per cent. would like a storeroom, 13 per cent. a pantry, and 28 per cent. both; only 1 per cent. said “Neither.” Of those who answered the question “Would you like a separate scullery?” 40 per cent. said “Yes” and 60 per cent. “No,” reflecting a desire to have the “kitchen” more as a dining and living room, with the dirtier work kept out of it.

Meal Arrangements

“Meals in the kitchen,” a somewhat controversial point, was answered in the following fashion:—

	Per cent.
Prefer to have all ordinary meals there	46
Breakfast and occasional meals	36
No meals	18

The frequent dissatisfaction with arrangements for having meals when visitors were present, expressed elsewhere in the questionnaire, was also illustrated in answer to the question “In what other places, apart from the kitchen, would you like space for serving meals?” The separate dining room ranked first with 30 per cent. The other choices in order of popularity were: Alcove off the kitchen 23



Type of heating preferred in a kitchen with an electric stove.

KITCHENS . . .

per cent., part of the living room 19 per cent., alcove off the living room 10 per cent., porch or veranda 5 per cent., and a combination of two of the above choices 13 per cent. Opinion, it seems, is fairly equally divided on whether, in the absence of a separate dining room, the kitchen or living room should be elaborated to provide for more formal dining, with the living room a little more popular.

Electric Stoves Favoured

Fuel ranges burning wood and coal and electric ranges are the almost universal alternatives for cooking stoves in the country areas of New Zealand, though in some districts electricity is not available. No one with an electric stove would prefer a fuel stove, and twice as many as have electric stoves would like them. Here are the figures:—

	Per cent.
With fuel stove ..	52
Preferring fuel stove ..	21
With electric stove ..	33
Preferring electric stove	67

Of the remainder a few thought that both types were required or preferred fuel or electric heat-storage stoves.

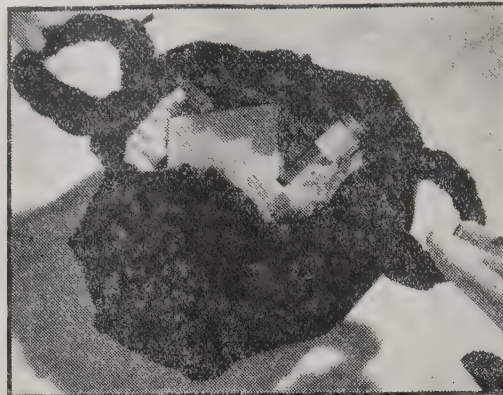
If an electric stove is used, and in the absence of central heating, the problem of keeping the kitchen warm arises. For that the open fire is most popular, 46 per cent. preferring it, with a destructor for water heating (17 per cent.) and electric heaters (15 per cent.) in second and third places; only 5 per cent. thought no heating was necessary.

Conflict was apparent between this and a later question, "Would you like an all-electric house?" Some of those who said "Yes" specified an open fire for kitchen heating, evidently interpreting "all-electric" as referring only to the equipment. Other minor confusions were revealed in varying meanings attached to kitchen, kitchenette, scullery, and pantry. Traditional usage obviously plays a part here—the "kitchen" remains the kitchen, though it is now used as a "living-living room, and the "scullery," though modernised with paint, new equipment, and cupboards into a charming kitchenette, is still the scullery, retaining with the word the aura of Victorian basements and depressed "tweenies."

Once the basic ideas of size, floor space, and type of accommodation and equipment required are clear, it is much easier to plan for the detailed arrangement of the kitchen and to proceed with the task of adapting to New Zealand conditions the results of overseas research.

A Smart Handbag for Evening Wear

THE evening handbag shown in the accompanying illustrations makes an attractive accessory to an evening frock and can be made from left-over scraps of the evening frock material. It is a very convenient size for evening wear, yet is large enough to hold all requirements for the evening out.



THE materials required are:—

Two pieces of material 10in. x 9in. (for the sides).

A gusset strip 28in. x 3in. and a number of cross-strips.

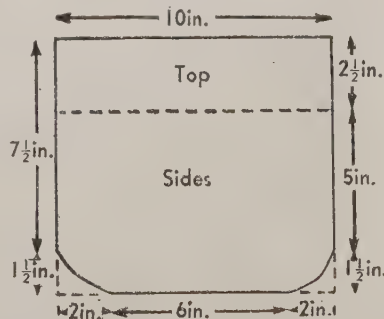
1½ yards of piping cord.

Two press studs.

Any small scraps of silk will do to line the bag, as long as there are two pieces 6½in. x 10in. and a gusset strip 28in. x 3in.

Method of Making

Shape the sides of the bag as shown in the diagram. The sides of the lining are cut the same size, but extend



only as far as the dotted line in the diagram. If there is not quite the length of material necessary, a neat join can be made in the gusset strip. Cut cross-strips 1½in. wide and join them to make two 28in. lengths to cover the piping cord, and cut cross-strips 2in. wide and join them to make three 48in. lengths for the plaited handles and the trimming at the top of the bag.

Mark the centre of the top of each bag piece and make a small pleat, taking up ½in. of material. Make another small pleat each side of the centre pleat. Halve the piping cord and cover each piece with the cross-strips. Tack the piping cord between the sides of the bag and the long sides of the gusset, and stitch all together. Join the second side to the gusset, with piping cord between in the same way.

Turn in the top edge of the bag 1½in., and slip-stitch it.

Fold the handle cross-strips in half lengthwise, right sides facing, and stitch along the edge. Turn them to the right side and plait them together to make one long strip. Starting in the centre of one of the sides, and 1in. from the top edge, stitch the plait round half the bag to the centre of the other side. Make the handle loop, allowing 10in. of plait for it, and stitch firmly where the plaits cross.

Continue stitching round the top edge of the bag and make the other handle loop, slipping the end under the plait to meet the other plait end and thus hiding the join.

Making up the Lining

Make up the lining by joining the gusset in between the two side pieces. Slip the lining into the bag and turn in the raw edges at the top. Make small tucks in the lining top to make it fit the bag, slip-stitching the lining to the top of the bag.

Sew half a press stud on the inside at the gusset centre, ½in. from the top, and sew the corresponding half on the other gusset centre. Sew the other press stud at the side centres, ½in. from the top edge. To close the bag fasten the press studs at the top of the gusset, and then fasten the centre stud.



Old-fashioned Flowers are Often Best

FASHIONS in flowers change, just as do fashions in women's hats. In this article J. P. Hudson, Horticulturist, Wellington, puts in a plea for the restoration to favour of some of the flowers that have gone out of fashion.

AS plant collectors scour the world for new species, and plant breeders continue to improve on varieties already in cultivation, the nurseryman's catalogue, like Barnum's Circus, gets "bigger and better every year." No doubt many of the newer introductions are far more beautiful than their predecessors, and anyone looking through old gardening books can afford to smile at engravings of some of the flowers of a hundred years ago—so many of them stiff and formal, even bizarre, and quite lacking in the charm now expected in garden flowers.

At the same time, to be quite honest, it must often be admitted that in other ways such good progress has not been made. Looking again at the old illustrations, and making full allowance for the peculiar tastes of the great-grandparents of this generation, it must be admitted that the plants illustrated were often of a size and quality that are rarely seen today. The trained gardener then was essentially a plantsman, a past master in the art of growing specimen plants, each one unscathed by pest or disease, exactly symmetrical in shape and, in its season, bearing a profusion of perfect blooms that would put to shame many of the exhibits that win first prizes in shows these days.

It is no use regretting the spacious days when horticulturists had the time to spend on producing such specimens. Many of the plants, and most of the plantsmen, have now been lost for ever. However, the present-day gardener can turn with profit to the lists of plants which used to be popular and consider whether dropping some of them has been altogether wise.

A Wellington Experiment

Two years ago some flower borders were planted up in a Wellington home garden with the aim of seeing which border plants pay the highest dividends of flowers. For the past 18 months the borders have been examined week by week and the plants judged not only on the number of flowers they were bearing at the time but on the amount of colour, judged by viewing the borders from a distance. The results of the trial are very illuminating.

The four plants which head the list as sources of border colour are pot marigolds (calendulas) in orange and yellow varieties, pink marguerites, orange-purple hybrid wallflower, and the mauve alyssum Lilac Queen. Each of those has now been in continuous bloom for more than 18 months and has made a worth-while contribution to the colour display throughout the whole of that time.

Those four are all easy to propagate, the marigold and alyssum from seed and the other two from cuttings, which will root readily in a frame at almost any time of the year under Wellington conditions. It is a curious fact that, though those four varieties have been in flower continuously for so long, two of them are normally classed as "annuals."

No special trouble was taken in cultivating the trial borders, which were



[Douglas Elliott photo.]

dug over two years ago before being planted and have not been dug since, though kept hoed at first and hand weeded later when the plants filled the borders. Each spring the borders have been given a topdressing of complete flower border fertiliser (3 parts of blood and bone, 2 parts of superphosphate, and 1 part of muriate of potash, at the rate of 2oz. a square yard) and a generous mulch of well-rotted compost.

Dead Flowers Must be Removed

The borders have not been watered since being planted, but very particular attention has been paid to the removal of old flowers on the marigolds and marguerites and over-

grown flower spikes on the alyssums and hybrid wallflowers. Faded flowers and overgrown spikes have been cut off without fail every week throughout the trial. Whenever plants of any of the four species began to look "leggy" they were cut down to within a few inches of the ground and allowed to grow again, thus rejuvenating themselves, but as that treatment was applied with discrimination, and only a few plants were cut down at any one time, the general appearance of the border was little affected, though the plants concerned were much improved.

Gardeners in the milder districts who are not connoisseurs of rare or difficult plants, but are mainly interested in having cheerful, colourful gardens all the year round at little expense and the minimum of trouble, should make more use of these, and other, old-fashioned flowering plants, including geraniums, which now tend to be neglected.

The hybrid wallflower, the result of a cross between a true variety of wallflower and a species of *Erysimum*, is sterile and does not produce seeds, so must always be propagated by cuttings. Hybrid wallflowers were first introduced as "fairy wallflowers" and various named varieties were offered, but it is doubtful whether they are still available true to name in New Zealand. They have been listed here under various names, including *Cheiranthus mutabilis*, *C. lewensis*, *Erysimum linifolium*, and "purple Siberian wallflowers," though none of those is strictly correct. An interesting feature of these hybrids is that the flowers open an orange, light brown, or yellow colour but change to rosy purple or lilac purple as they become older, with the result that each spike bears flowers of two or three colours at the same time.

WATCH OUT!

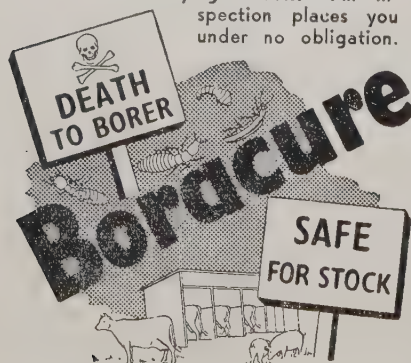


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GARDEN WORK FOR DECEMBER

Bulbs which are to be lifted (hyacinths and tulips annually, narcissi about every three years) should be dug up as soon as the leaves have died down, cleaned, and put away for the summer months in a dry, airy, cool place. To leave bulbs, especially tulips, lying about in the sun or to store them in a warm place is asking for trouble; hot storage conditions may prevent proper flowering in the following season.

Cyclamens for growing in the house or greenhouse should be potted up now in John Innes potting compost, which should not be made as firm as in potting most plants. The corms are usually pressed lightly into the surface of the soil and not completely buried.

Dahlias may still be planted out to make a useful show of flowers in the late summer and autumn. A good plan is to keep a few pot-grown plants for that purpose to use for filling the gaps where spring- and early summer-flowering bulbs and plants have been removed. If dahlias planted earlier are becoming overcrowded, pull out the thinner shoots from the centre of each plant, especially if large flowers are wanted, but little thinning is usually needed if the plants are being grown for the maximum garden display.

Garden plans and diaries can be of the greatest help in bringing a garden to perfection. If at any season a corner of the garden is dull or empty, have a good look at the local parks and neighbours' gardens with a view to seeing what is then in flower and would be most suitable to fill the blank next year. Make a note about the suitable items to remember to order, sow, or plant them at the proper time.

"Gardening for dry weather" means catching the winter rains, holding as much moisture as possible in the soil, conserving it in the summer, and watering only as a last resort. Moisture can best be conserved in the summer by keeping the ground cultivated often to kill weeds and prevent them from competing with the garden plants for the available moisture, and by mulching the soil with a thin layer of lawn mowings, fine compost, or leaves to protect it from the drying effect of the sun's rays and to prevent rain from beating directly on to the finely-cultivated surface and causing it to cake.

Hanging baskets of flowers add a splash of colour to the sunporch or greenhouse, and flowers seen from below often display a quite unexpected beauty. The wire basket should be heavily lined with sphagnum moss, then filled with a good compost (John Innes potting compost is ideal). Begonias, fuchsia (Ballet Girl), lobelia, *Asparagus sprengeri*, and ivy-leaved

geraniums are all suitable for planting in hanging baskets, and the native *Fuchsia procumbens* with its greenish-yellow flowers, blue stamens, and shining, pale red berries makes a most interesting basket plant, though not showy like the others suggested.

Iris of the bearded varieties should, where necessary, be transplanted in December or January, as they have fewest roots at this season, can be moved with very little check, and will flower next season. The fleshy rhizomes should be broken apart and each piece planted level with the surface of the soil and not buried.

Lawns which can be watered should be given a good soaking before they begin to go brown. An occasional thorough soaking does much more good than frequent light sprinklings, which only moisten the surface without wetting the lower levels of soil where the grass roots are trying to collect moisture.

Pot plants in the house, such as pelargoniums, geraniums, balsams, and fuchsias, should now be in full flower. They should be fed about every two weeks, as described in the

September "Journal," and watered regularly, as the flower buds often drop from plants which have been allowed to get dry even for a few hours. Chrysanthemums growing in pots outdoors should also be carefully watched and watered whenever they need it—usually every day at this time of year.

Sow seeds of perennial plants such as violas, pansies, primroses, polyanthus, hollyhocks, *Alyssum saxatile*, aubretias, perennial candytuft, anchusas, thalictrums (especially *T. dipterocarpum*), heucheras, geums, columbines, oriental poppies, delphiniums, lupins, perennial phlox, and any other herbaceous perennials of which seed may be available. Sow them in boxes or a seed-bed. Lupin seeds germinate more quickly if a nick is chipped out of the coat of each seed with a knife before sowing. Iceland poppies can also be sown now in boxes.

Staking early is vital to the well-being of chrysanthemums, dahlias, herbaceous plants, the taller annuals, and gladioli. Nearly always there are heavy winds in the summer, and it is



[Douglas Elliott photo.]

The gorgeous colours of Russell lupins make them valuable cut flowers for informal arrangements. The coat of each seed should be chipped with a knife when being sown to ensure rapid germination.

GARDEN WORK FOR DECEMBER . . .

too late to stake plants when they have already been blown over. Ensuring that all plants are securely tied before the gardener goes away on holiday is especially important, even though they look hardly large enough to need a stake—it is surprising how much growth plants can make in two or three weeks at this time of year.

Weeds do not take a holiday at Christmas time, but a quick hoeing through the garden on a dry, windy day will kill most of the weed seedlings and ensure that they do not get out of hand while the gardener is on holiday.

Other Tasks for the Month

Thin **annuals** to at least 6 to 8 in. apart.

Layer **border carnations**.

Spray geraniums, cinerarias, and calendulas with lead arsenate to kill **caterpillars** at the first sign of holes in the leaves.

Plant **colchicums**, **sternbergias**, and other autumn-flowering corms and bulbs.

Stop **border chrysanthemums** by pinching out the tip of each shoot to make plants bushy.

Take cuttings of zonal and ivy-leaved **geraniums** and root them in a frame (see February, 1947, issue).

Feed **gladioli** when the flower spike can be felt inside the leaf sheaths.

Reminders About Common Troubles

Aster blackleg is the common disease which attacks fully-grown

asters, causing them to wilt and die just when they should be coming into flower. This disease is caused by a fungus which lives in the soil from one season to the next and can be reduced to some extent by not growing asters in the same place more often than one year in three or four. However, the best method of controlling the disease is always to water aster plants with a solution of Cheshunt Compound as soon as they are planted. This material can usually be bought made up in a form that needs only dissolving in water. If any plants do go off with blackleg after this treatment, each should be carefully lifted, with the surrounding soil, and burnt. The hole from which it was taken should then be soaked with Cheshunt Compound solution.

Large narcissus flies are an important and common pest of a wide range of cultivated flowering bulbs. They are often marked with red or orange bands, and are stout, hairy insects rather resembling small bumble bees, but with only two wings instead of the four with which all bees are equipped. The flies lay their eggs on the leaves of bulbous plants just before the plants die down, or sometimes crawl down past the leaves and lay eggs on the bulbs. The larvae eat their way into the bulbs, which may or may not be killed altogether but in any case will not flower in the following season. Affected bulbs are lighter than usual, shrunken, with a



An adult of the large narcissus fly, the larvae of which attack a wide range of flowering bulbs.

corky basal plate, and feel soft. The maggots can be seen if the bulb is cut down through the centre.

The pest is spread mainly by the lifting and distribution of affected bulbs, which contain larvae all through the dormant season. These larvae are not easy to kill, as they are completely enclosed within the bulb, but they can all be killed by hot-water treatment, which consists of soaking the bulbs in water at a temperature of exactly 110 degrees F. for an hour. This treatment is well worth while if new stocks of bulbs are being introduced into a garden where no bulb fly has previously been seen to ensure that the pests are not introduced. The treatment should be extended to three hours at 110 degrees F. in the case of narcissi if there is reason to suppose that the bulbs contain eelworm, but that prolonged treatment often results in a malformed flower being produced in the next season.

A simple, routine measure is to cultivate the soil thoroughly between bulbs as the leaves start to wither, and also immediately after the dead leaves are removed if bulbs are not being lifted. That closes the hole where the leaves grew through the soil and makes it much more difficult for the flies or larvae to reach the bulb. When bulbs are lifted they should never be left lying on the ground to dry in gardens where bulb flies occur, as the flies will be attracted to bulbs lying about and will lay eggs on them.

Greenfly which infest the very young leaves of pot marigolds (calendulas), asters, antirrhinums, pelargoniums, balsam, and other garden plants often cause the young leaves to grow wrinkled and puckered. These greenfly are easy to control by spraying with nicotine sulphate and soft soap, a derris spray, or, most effective of all, the nicotine-white oil spray described in the October issue. A derris dust will usually give a good control, especially if applied with one of the home-garden hand dusting machines now on the market.



Pink marguerites will make a bright splash of colour all the year round in relatively frost-free areas if dead flower heads are picked off without fail every week.

ATTRACTIVE CHRISTMAS GIFTS

By EVA TOPPING, *Rural Sociologist, Auckland.*

MOST needlewomen like to make some of their Christmas presents, and such gifts, specially made to supply some particular need of the recipient, are a pleasure both in the giving and receiving. Here are directions for making several articles which will be both decorative and useful if attractive materials are chosen. As an evening's work will make most of these presents, they should appeal to the busy woman whose gift list is long and whose time is limited.

CARDBOARD boxes of various sizes wrapped in pretty papers and tied with tinsel or ribbon bows give the parcels an appropriate Christmas appearance.

Tray Cloth and Tea-cosy Set

A tray cloth with tea-cosy to match will make a pretty addition to the morning or afternoon tea table. Even during the warm weather tea is much nicer when kept hot under a cosy, but the usual woollen one can be changed for something which looks more appropriate for the summer months. Gingham, seersucker, and cotton prints are favoured materials for sunporch or kitchen meals, and chintz, printed linen, and cretonne are quite at home for more formal occasions. Amounts of materials required are:—

$\frac{1}{2}$ yard of 48in. or $\frac{3}{4}$ yard of 36in. patterned material.

3 yards of bias binding in a colour to match one tone of the design.

$\frac{3}{8}$ yard of 36in. material for tea-cosy pad.

1 yard of wadding for stuffing.

Cut the tray cloth to 14in. by 20in., tack the binding on with mitred corners, and machine near the edge with matching mercerised cotton. If the binding is carefully tacked with even widths on the right and wrong sides of the cloth, one row of machine stitching will secure both edges neatly.

Cut four pieces of lining material 12 $\frac{1}{2}$ in. wide and 9 $\frac{1}{2}$ in. high for the cosy pad. Keep the sides straight for 3in., then curve them gently to the 9 $\frac{1}{2}$ in. mark at the centre, as shown in Fig. 1. Cut $\frac{1}{4}$ in. from the curved edge of two pieces for the inner lining. Make a single seam on each pair round the top, leaving the bottom open. Turn the larger pair right side out. Cut four pieces of wadding $\frac{1}{4}$ in. smaller round the top and $\frac{1}{2}$ in. shorter. Sandwich the inner lining between double thicknesses of wadding and over-sew with large stitches round the top so that the wadding will stay in place when the cosy is made. Slip on the outer lining, turn in the lower edges of both linings, and over-sew

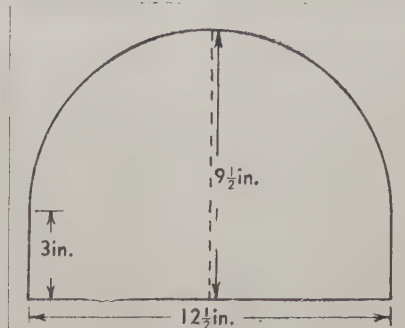


Fig. 1—Method of cutting material for the tea-cosy.

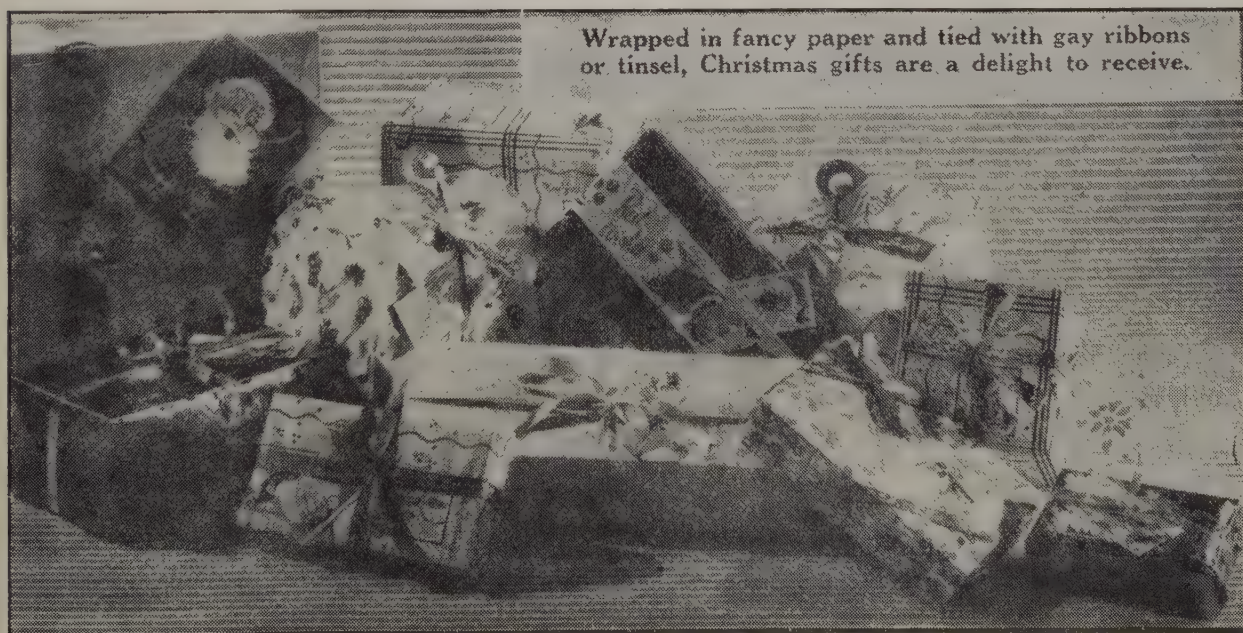
by hand or machine stitch close to the edge.

Cut two pieces of chintz the same size as the outer cover and tack them together with the right sides out. Tack bias binding round the curved edge, keeping the width even on both sides, and machine round close to the edge. The seam and turnings inside the binding will give a corded effect to the curved edge. Turn a hem along the straight edge and sew by hand, leaving no stitches visible on the right side.

The illustration on the next page shows the tray cloth and tea-cosy set and an inset of the cosy pad.

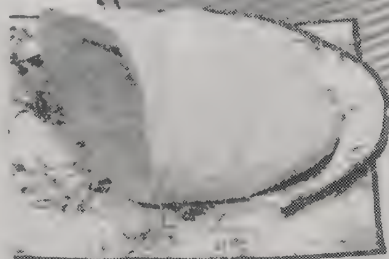
Table Mats

Table mats are always an acceptable gift, for beside being in vogue they

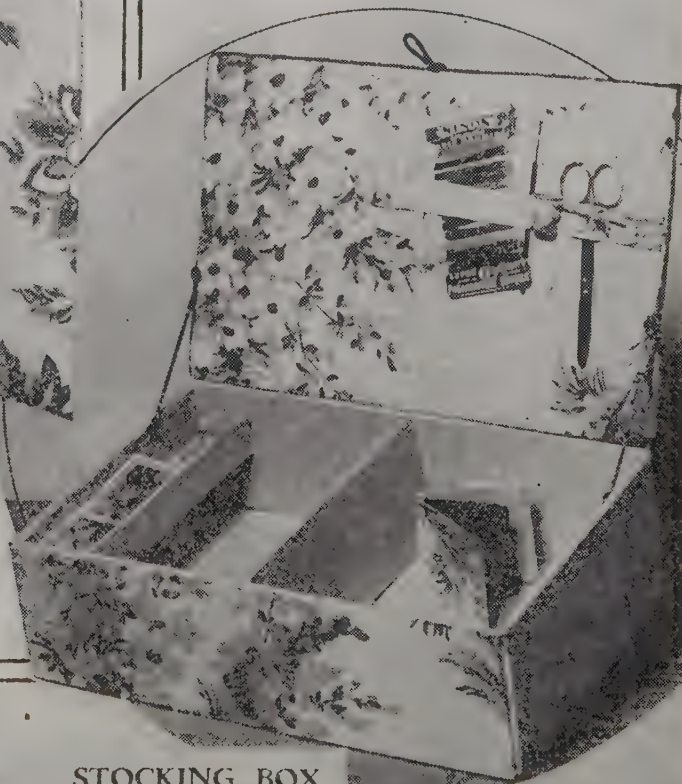


[Sparrow Industrial Pictures Ltd. photo.]

TRAY CLOTH AND COSY



BLOTTER



STOCKING BOX

save time in ironing and laundering table linen. Linen roller towelling, which is on sale in various conventional floral patterns, multi-coloured overchecks, or stripes, may be used. The width, 16½ in., is just right for a large-sized place mat which will accommodate a dinner plate and cutlery comfortably. If the towelling is patterned, care must be taken when buying to see that the design is repeated on the material within about 12 in., which is the size of the mat, so that each mat is exactly like the others. The same number of complete designs as mats required must then be bought and a small amount may cut to waste at each end of the length. With vertical stripe patterns there is no difficulty in making each mat alike, and perhaps there will not be much waste with the large overchecks. Centre the designs and draw threads between as a guide to cutting.

Draw a thread ¾ in. from each cut edge. Run a line of machine stitching exactly on the drawn thread line, starting 2 in. in, stitch to the edge, turn the mat without breaking the thread, sew across to the other edge, turn again, and sew back 2 in. Unravel the threads of the cloth back to the row of machine stitching to make the fringed ends. The selvedge edges need no finish.

"Mother and Daughter" Aprons

Any little girl will be delighted to have an apron "just like Mother's" and with it will be easily persuaded to help to set the table, put away the saucepans, or wipe the spoons and other unbreakables. The pair of aprons are quickly made and can be cut from 1 yard of 36 in. wide cotton goods (Fig. 2). Floral-patterned materials could be used, but the wide crossway frills are a more decorative feature if plaid, checked, or striped fabric is used. A dinner plate makes a cutting guide for the centre panel of the "mother" apron and a tea plate is just the size for the miniature.

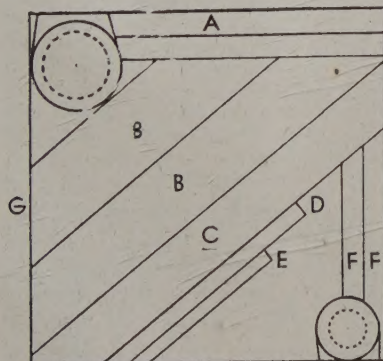
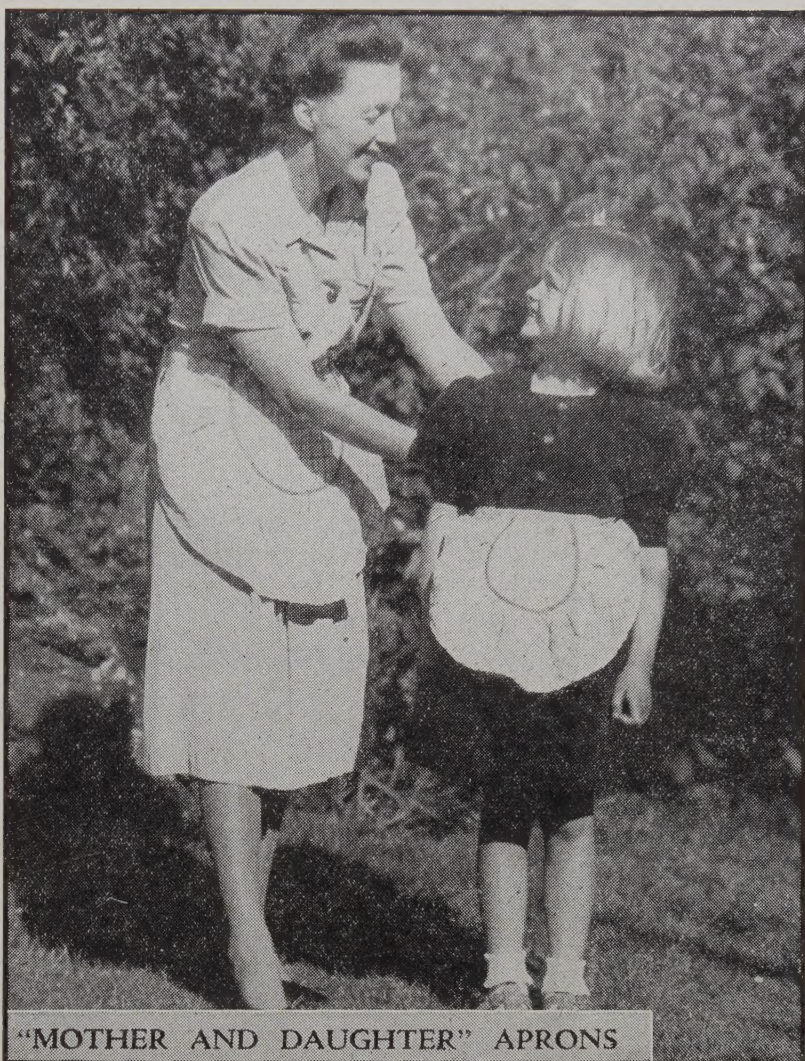


Fig. 2—Aprons cut from 1 yard of 36 in. wide material. A string, B wide flounce, C narrow flounce, D wide waistband, E narrow waistband, F string, G selvedge.



"MOTHER AND DAUGHTER" APRONS

[Sparrow Industrial Pictures Ltd. photo.]

The wide flounces are cut on the true bias of the material and are one and a half times as long as the measurement around the curved edge of the centre part. For the bigger apron the flounce is 7½ in. wide and the material will have to be joined to get the right length. For the smaller flounce a width of 5½ in. is sufficient and the length will be obtainable in one piece. Bias strips 1½ in. and 1 in. wide make the waistband, to which the tie-strings are attached. They are 1½ in. wide x 21 in. long on the bigger apron and 1 in. wide x 14 in. long on the smaller one. Hem the flounces with ¼ in. hems. Gather the top edge and mark at the half and quarters with pins. Mark the centre panel in a similar manner and arrange the fullness of the flounce evenly on the centre piece. Tack the bias binding on with the gathering sandwiched be-

tween the binding and the centre piece. Machine-stitch along, take out the tacking threads, and fold the binding over the raw edges. Hand-hem the binding on to the plain panel just along the row of machine stitching and press the bind over toward the centre. Hem the strings. Tack the crosswise piece of material on to the top of the apron and along the raw edge of the flounces from the wrong side, and stitch. Pleat the strings and set in at the end of the waistband. Turn the band over to the right side and stitch close to the fold of the hem and at the ends.

Stocking Box

The box for holding stockings has a division down the centre to separate the mended pairs from those which need darning. Balls of mending silk

ATTRACTIVE CHRISTMAS GIFTS . . .

are in a fixed tray at one side and there is a needlebook to match the box. Scissors, thimble, a spare packet of darning needles, cards of mending, and a ladder hook are in a strap on the lid. Materials required are:—

Cardboard

Two pieces 14in. x 9in. for top and bottom

Two pieces 14in. x 4½in. for front and back

Three pieces 9in. x 4½in. for sides and partition

One piece 9in. x 2in. for base of tray

One piece 9in. x 1in. for side of tray

One piece (lighter weight) 6in. x 3in. for needlebook

Other Materials

¾ yard of 30in. wide patterned material for cover

¾ yard of 30in. or 36in. wide plain material for lining

2½ yards of silk blazer cord

2 pieces of wadding, 14in. x 9in.

Small pieces of woollen material or needlework felt for leaves of needlebook.

Cut the cardboard to the required sizes, then, using each piece as a guide, cut the covering material into sections as follows, allowing a good turning on each piece, and choosing the prettiest part of the design for the outer covering of the box lid:—

Two pieces for the lid (about 14½in. x 9½in.)

Two pieces for the back and front

Two pieces for the short sides

One piece for the needlebook

Two pieces for the tray

One piece 12in. x 2in. for the strap on the lid

Cut the lining material to the same sizes plus one extra piece about 10½in. x 10in. for covering the centre partition. Take the two large bits of lining material and stitch round three sides to make the same size as the cardboard. Keep the stitching very straight and make the corners absolutely square. Trim the edge, turn it, and slip the cardboard in it; turn in the raw edges and over-sew by hand. Make the end and side sections of the box the same way, using one piece of lining and one of the covering material for each section. Join the four pieces with over-sewing at the corners, and over-sew to the lining-covered base. Trim the piece of cardboard for the centre partition so that it will fit into the box without buckling. Narrow shavings will probably be sufficient, as the materials are not very thick, but allowance must also be made for the seams on the covering of the partition.

Cover the partition with the lining material and fix it into the centre of the box by stitching right through the cardboard and lining, leaving no stitches visible on the outside.

Make the tray in the same way, trimming the cardboard first, and attach it at one end of the box, near to the top edge. Sew down the long side of the piece of covering material for the strap, turn it right side out, and set it in place on the inner covering. Stitch it across to make the various divisions, leaving sufficient room for the hook, scissors, and thimble to fit in. Sandwich the cardboard for the top between two pieces of wadding and over-sew with large stitches. Machine the two lid coverings together round three sides, insert the wadding-covered cardboard, turn in the ends, and over-sew. Attach the lid to the back of the box by hand sewing with close, firm stitches. Make two cord stays to prevent the lid falling back and attach them at the sides and to the inner top covering. Sew a length of cord round the edges of the lid, making a loop at the centre front.

Make a button and shank of cord, and sew it to the centre front of the box in the right position to form a neat fastening with the loop on the lid.

The needlebook is covered in the same way as the sections of the box and is then folded in half and pressed by being placed under a heavy weight for several hours. Make leaves of woollen material or needlework felt in colours to match the design and sew securely to the centre fold.

Blotter

The friend who has much correspondence will welcome the gift of a

blotter with pockets for unanswered letters, airmail cards, stamps, labels, and other stationery. The open blotter, showing the pockets for stationery, is illustrated on page 526 with an inset of the blotter closed. Firm materials which will not soil easily, such as tapestry, printed linen, and other furnishing fabrics, are the most suitable. The materials needed are one piece of covering material 30in. x 12in., one piece exactly the same size for lining, two pieces of cardboard 10½in. x 11½in., two sheets of coloured blotting paper, mercerised cotton, and a length of stranded embroidery cotton. Tack the covering and lining strips together with right sides facing and stitch them by machine ¼in. from the edge on the long edges. Turn the join to the right side and press the seams. Fold in half crosswise and press two marks ¼in. from the centre fold and two 3½in. from each end, and turn the raw edges (Fig. 3). Machine down the two centre marks, insert the cardboard as stiffeners, and machine the two ends. Fold back the ends over the cardboard and over-sew by hand the pockets thus formed. Back-stitch one pocket on to the lining for 1½in. at the centre to make two compartments. On the other pocket back-stitch an oblong at the centre for stamps, making it 2½in. long and 1in. deep. This stitching will also form larger pockets on the other side, large enough to hold airmail and ordinary letter cards. Cut two sheets of blotting paper in half and fold and attach them to the centre of the blotter with long stitches of stranded cotton, using six strands in the needle. Tie the stranded cotton firmly at the centre of the blotting paper pages. Slip a few envelopes, letter cards, labels, customs declaration slips, and stamps into the pockets, and put writing paper or a block between the pages to complete the gift.

"Sewing Plastic Materials"

IN the article "Sewing Plastic Materials," published in the October issue of the "Journal," the illustration showing the apron, waterproof bag, and sponge bag was inadvertently placed over the caption which should have accompanied the raincape and hood.

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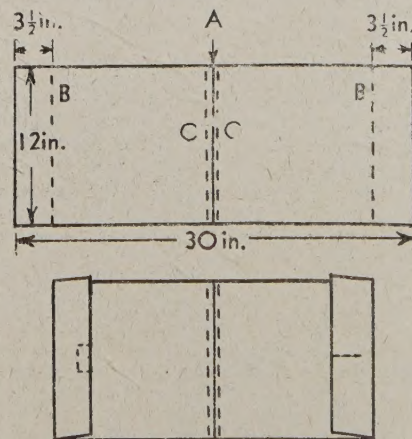


Fig. 3—Method of making the blotter. A centre fold, B end fold, C stitches.

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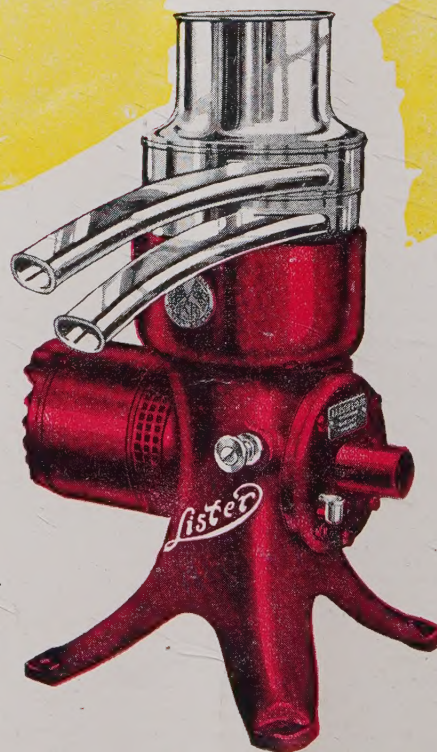
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